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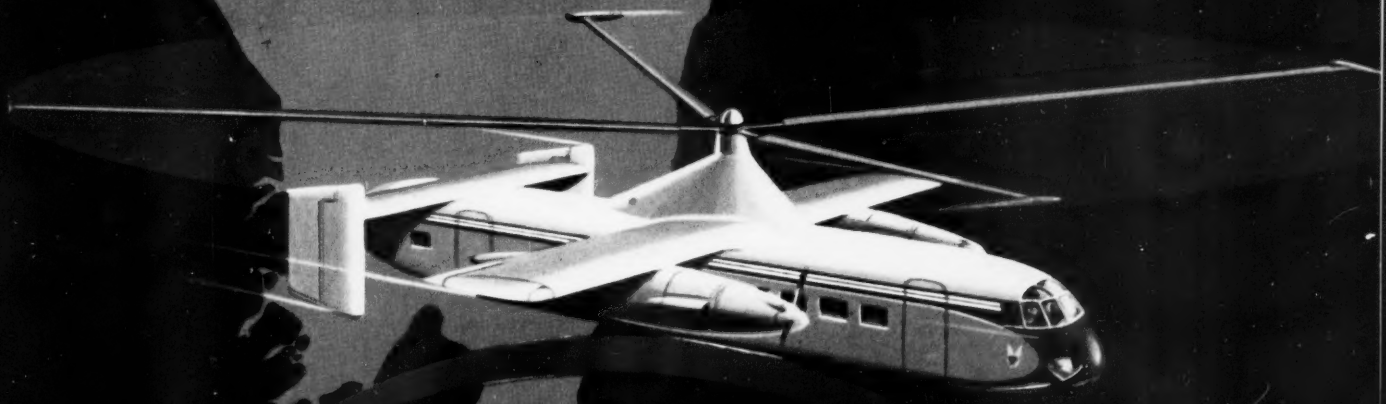

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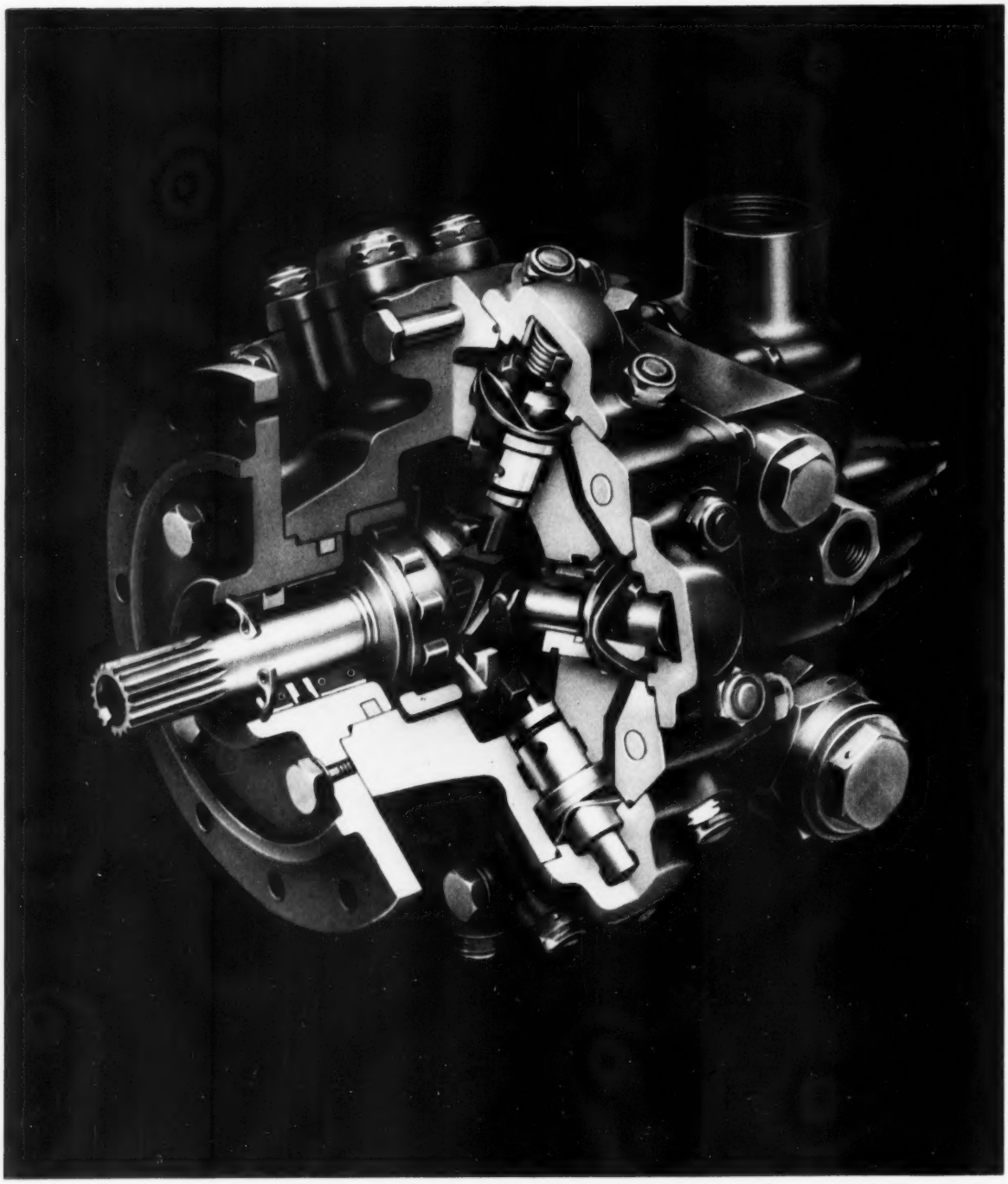

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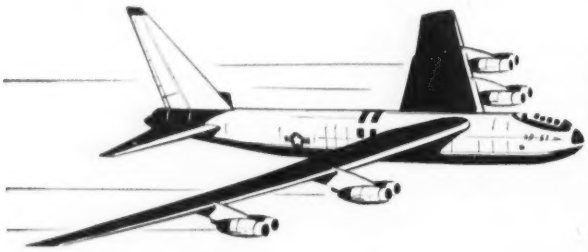
J-57 TURBOJETS IMPRESSIVE IN PERFORMANCE

Pratt & Whitney Aircraft's big J-57 turbojet is rapidly proving to be one of the finest turbojet engines yet developed, according to a report from the Boeing Airplane Company. The report was made at the conclusion of a full year of flight testing two Boeing B-52 Stratofortress bombers, each of which is powered by eight J-57 engines. The B-52 was the first airplane to use J-57s as prime power plants. The engines are mounted in four double-pod units, attached under and forward of the swept wings.



The engine was described as the best new power plant the company has had in any experimental airplane, and the engine's quick rate of acceleration was noted as an outstanding feature. The engine can reach full power in a matter of seconds.

Meanwhile in California, North American Aviation Company's J-57-powered F-100 jet fighter has completed first flight tests. Designed to fly at speeds greater than the speed of sound, the new swept-wing U. S. Air Force fighter is to be a successor to the famed F-86 Sabre, which achieved a 13 to 1 victory ratio over Russian-made Mig-15s in Korean air combat. During the first week of tests, the Super Sabre was flown eight times. It is reported to have exceeded performance requirements.

North American delivered the Super Sabre to the test flight base one month ahead of schedule.

HUGE PROPELLER DEVELOPED FOR TURBOPROP ENGINES

A huge, new propeller, designed especially to absorb efficiently the great power output of new turboprop engines, has been developed by Hamilton Standard Division. Heart of the propeller is the blade itself which is almost eight feet long from hub to tip, and two feet wide. It is the widest propeller blade ever developed. Hamilton Standard used the same rugged hollow steel construction for the new blade as that which it developed for the hydromatic propellers now used on many of the modern airline transports. The blade airfoil is a thin, hollow steel shell fitted over a hollow steel core. Air spaces within the shell are filled with a vulcanized synthetic material which, with the hollow construction, gives the blade great strength without excessive weight.

Three of the big blades are used on Hamilton Standard's new A-3470 propeller. This propeller is fully reversible, featuring hydromatic controls similar in principle to those used for piston engine propellers flown on most airline transports. By varying the size and number of blades, this propeller can be adapted for engines of over 9,000 horsepower and speeds of more than 500 miles per hour.

BELGIAN SABENA AIRLINES OPENS NEW HELICOPTER SERVICE WITH SIKORSKY S-55s

Belgian Sabena Airlines, which operates air services ranging from trans-Atlantic flights to schedules serving all of Europe, the Near East, and Africa, is establishing its inaugural routes for regular helicopter passenger flights, the world's first on international schedules. A fleet of big Sikorsky S-55 helicopters, each carrying seven passengers in addition to the crews, will be used for the service.

Service begins with three routes out of Brussels. The first is to Bonn, Germany, 131 miles, with intermediate stops at Liege and Cologne. A 60-mile non-stop service flies to Lille in northwest France. The third service covers the 73-mile distance between Brussels and Rotterdam, with an intermediate halt at Antwerp.

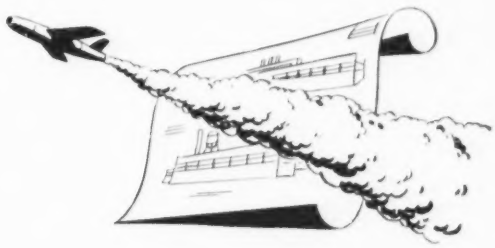
Sabena pioneered helicopter operations in western Europe, beginning airmail flights in 1950.

Meanwhile, in the United States, New York Airways has started carrying passengers in helicopters, also Sikorsky S-55s, between the three large airports in the New York City metropolitan area. Airline passengers from Europe arriving at New York International airport may now fly to LaGuardia or Newark airports for connecting flights to other parts of the United States. Helicopter rates are about the same as taxicab fares.

CHANCE VOUGHT BUILDS FACILITY FOR GUIDED MISSILE PRODUCTION

Production models of Chance Vought Aircraft's new Regulus guided missile will be completed, checked and tested in a large hangar building now under construction in Dallas, Texas. The new structure, costing an estimated $1,300,000, adjoins the present Chance Vought aircraft factory. Completion is expected early next year.

Regulus is a surface-to-surface missile. Its design and development for the U.S. Navy began in 1947, and first flight was in 1950. Production began recently.



Missiles leaving the production line in the main factory will go to the new hangar for final installation of internal components and systems. Complete flight simulation -- the equivalent of actual flight -- will test missile operation through engine starting, takeoff, climb, cruise and let-down maneuvers.

Among new development work at Chance Vought is the design, under Navy contract, of a new day fighter airplane. The division builds the twin-jet F7U-3 Cutlass fighter, and recently started production of the A2U-1, an attack version of the Cutlass.

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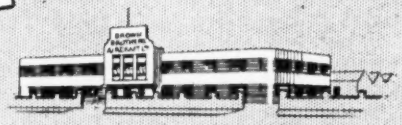

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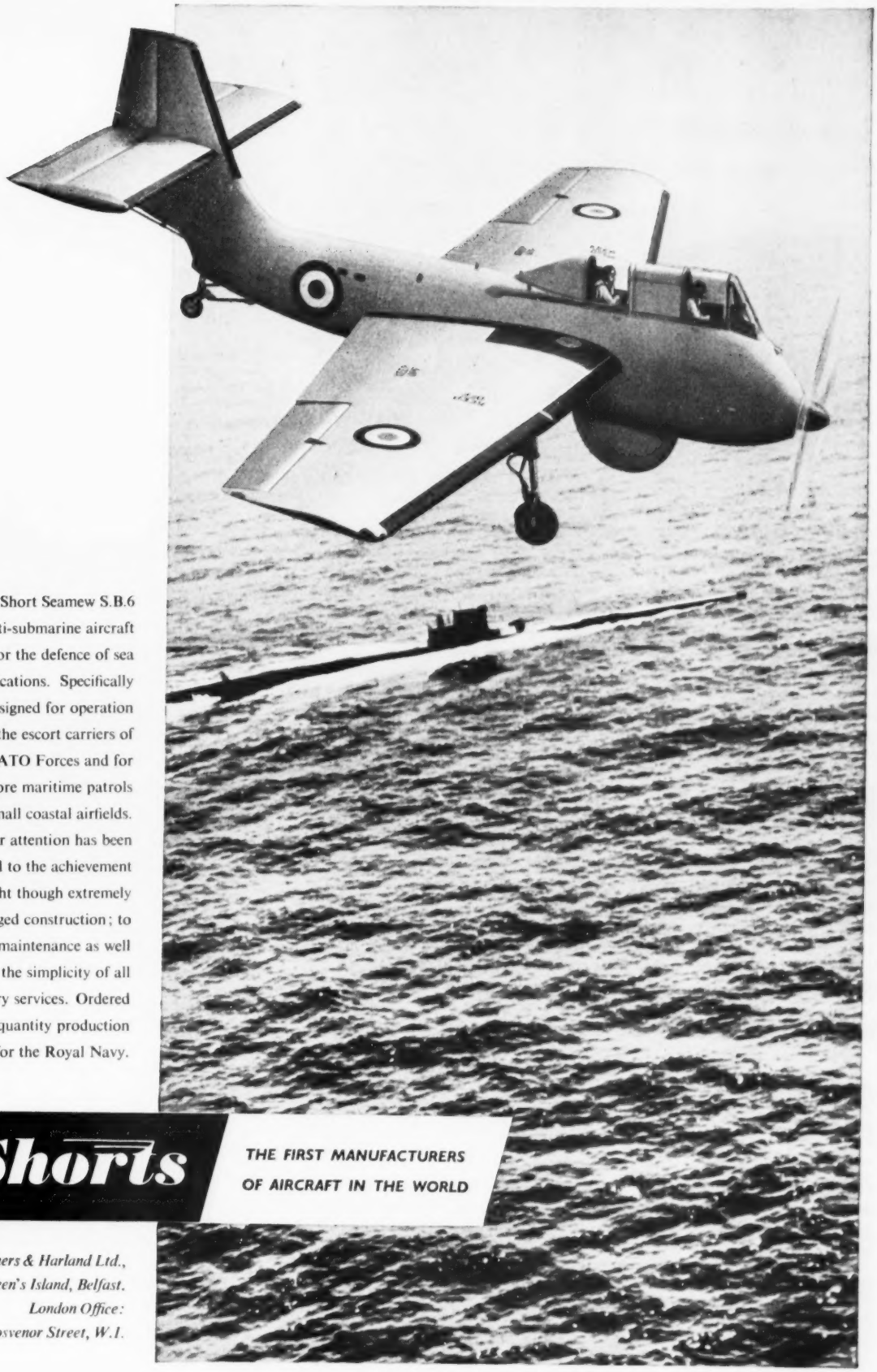

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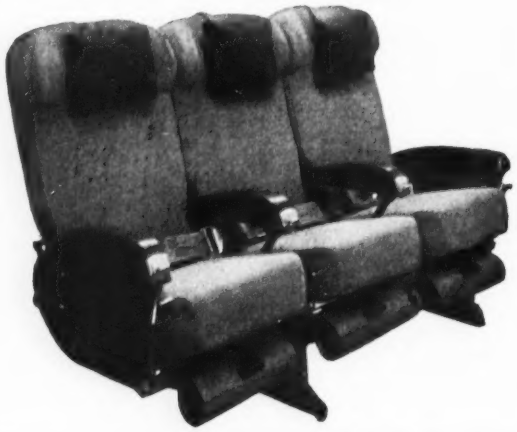

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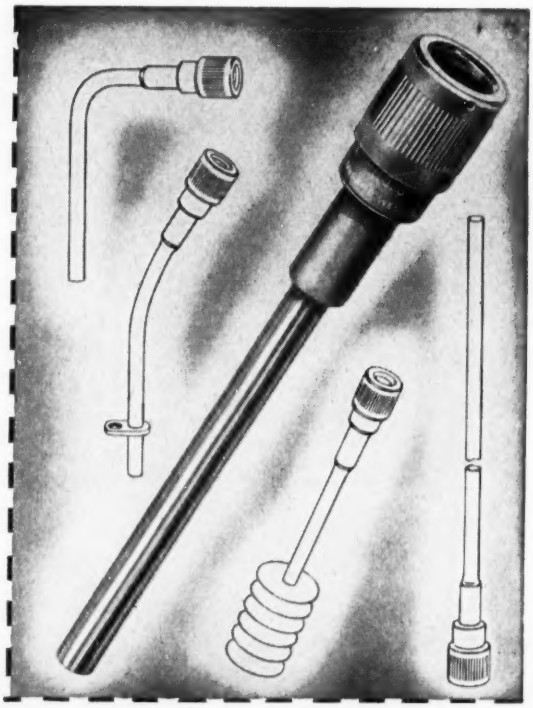

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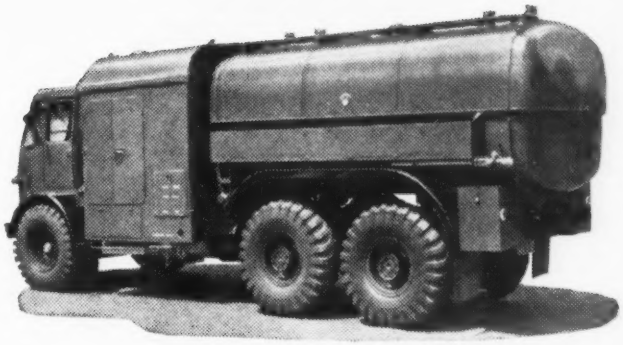

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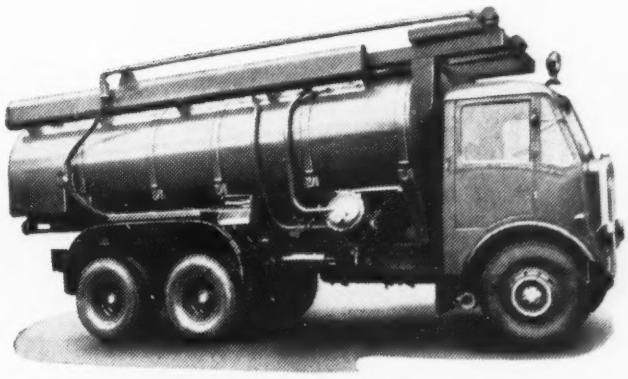

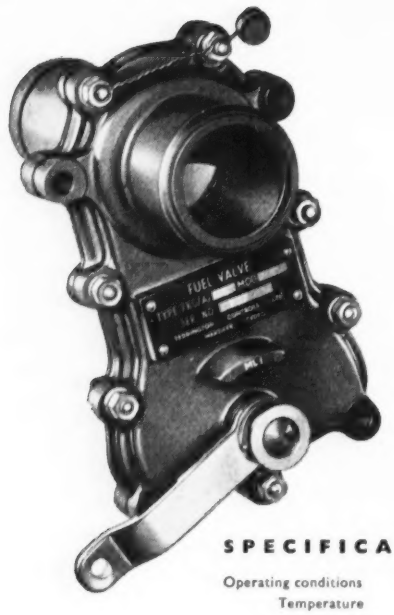

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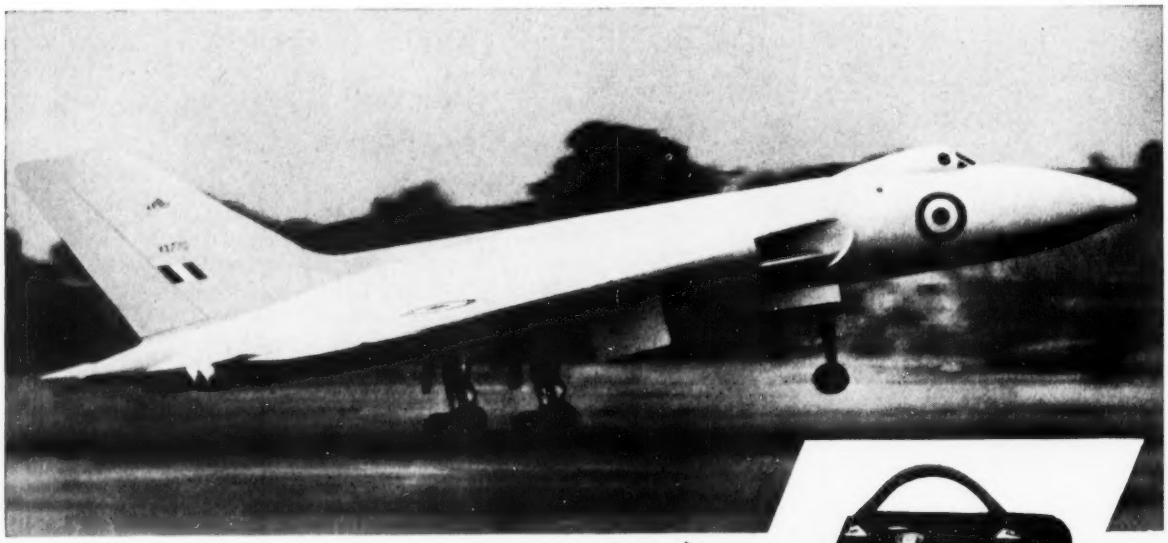

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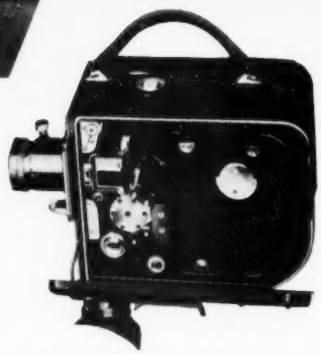

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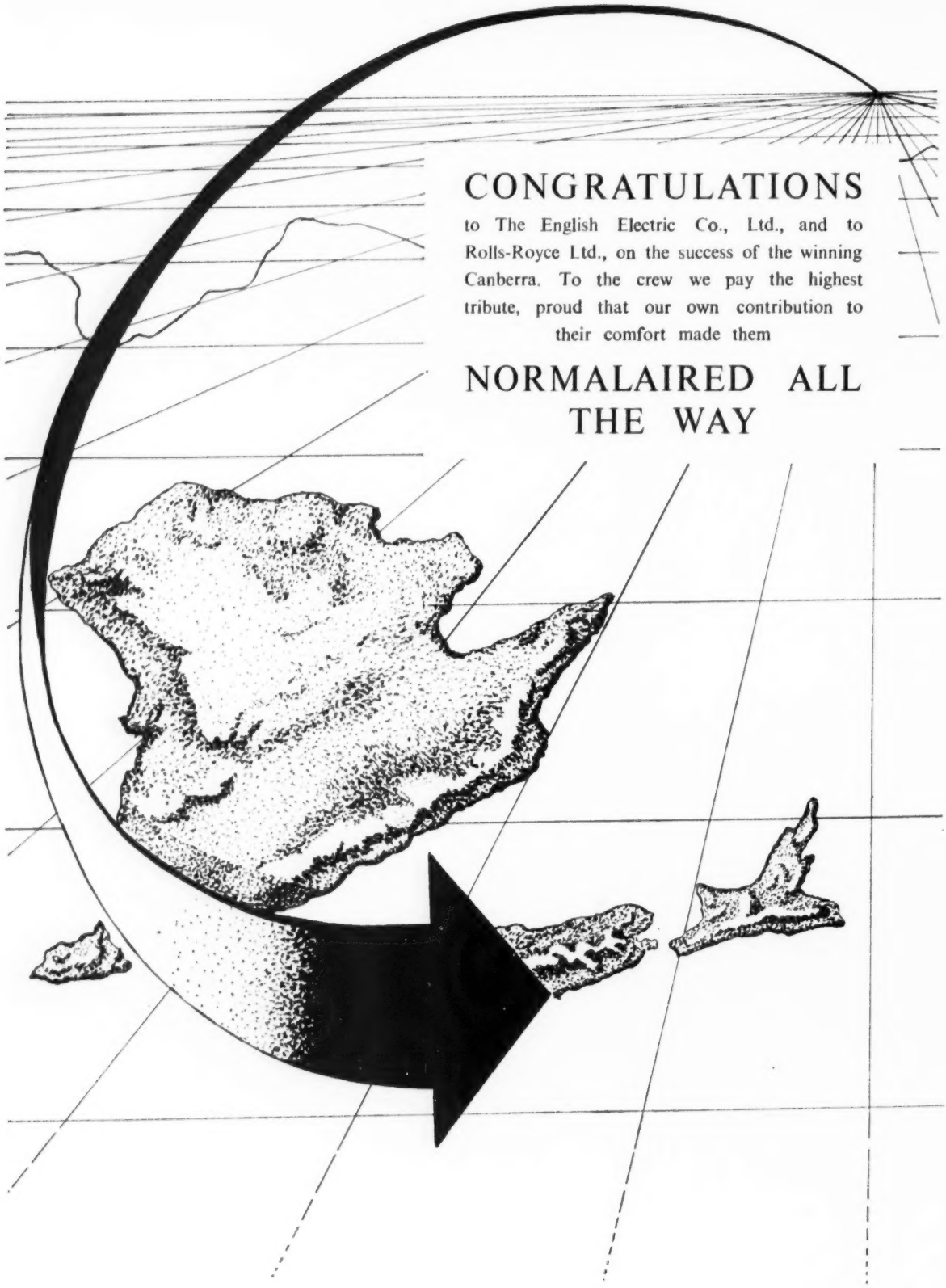

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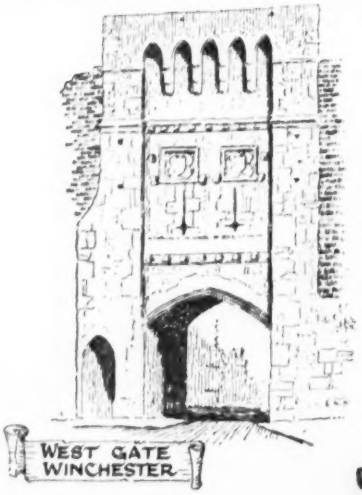

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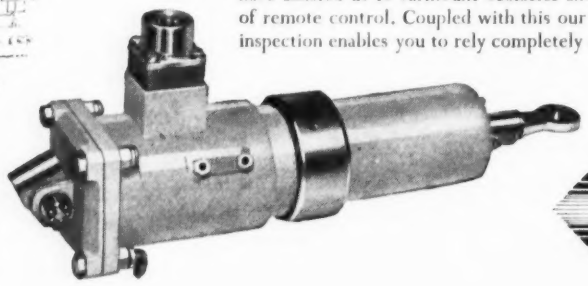

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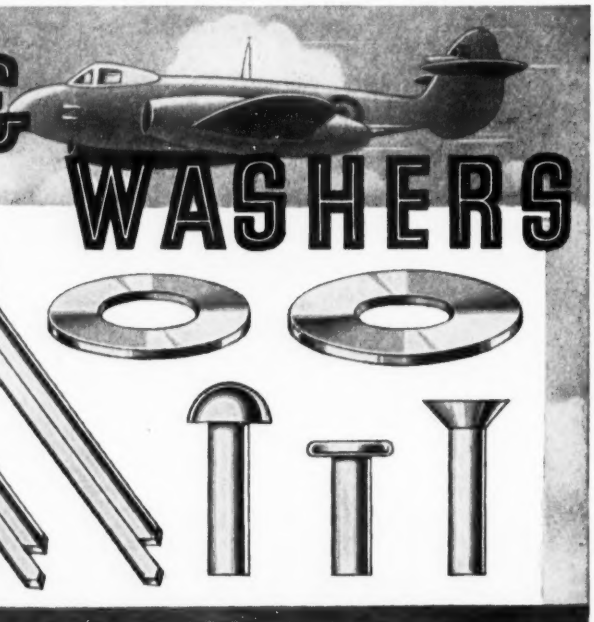

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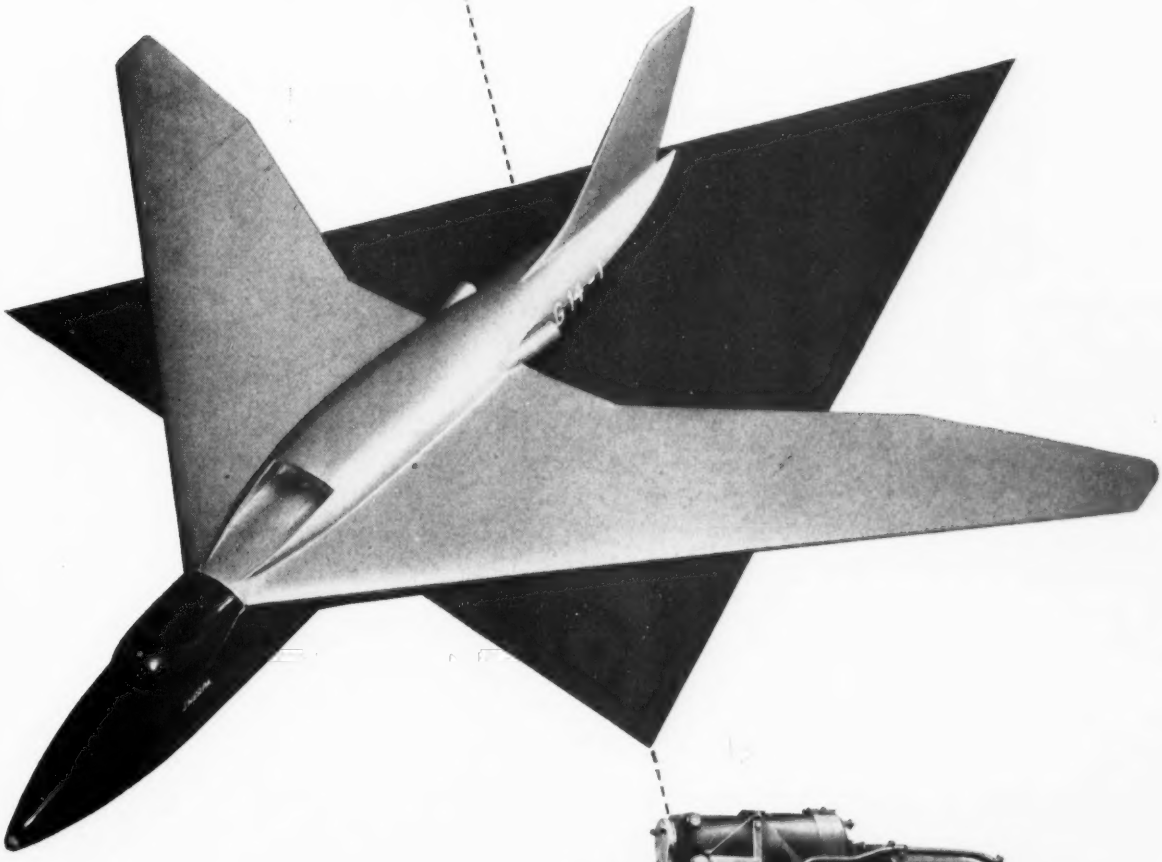

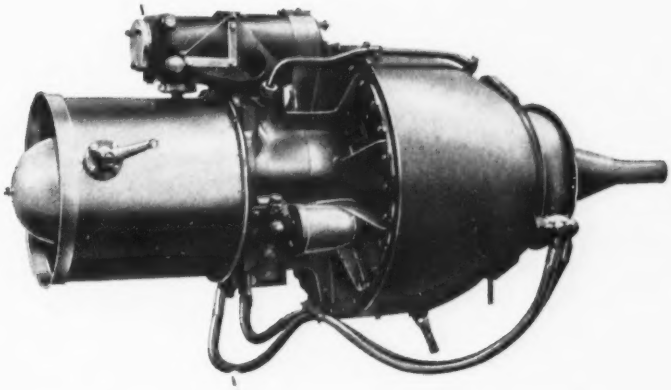

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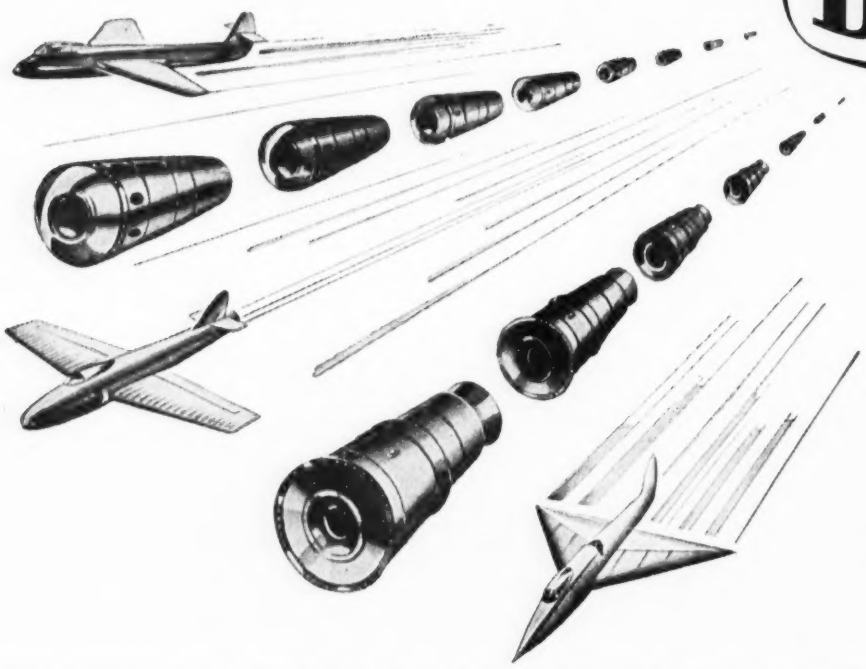

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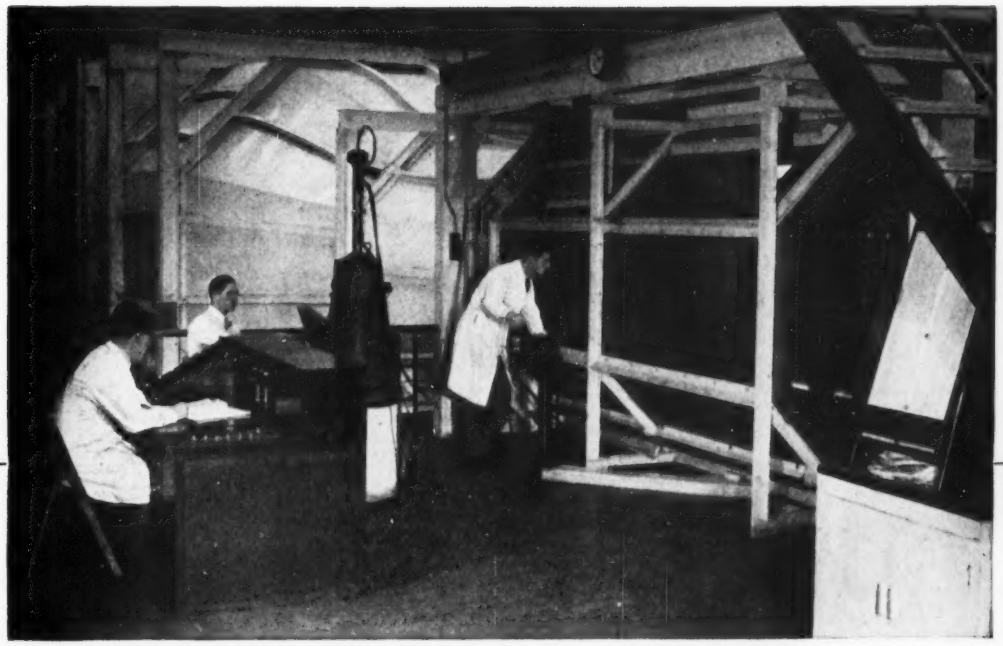

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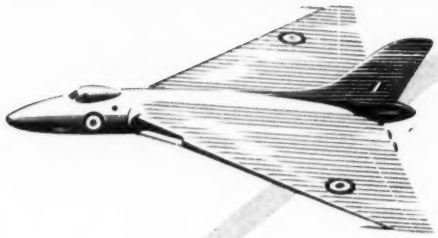

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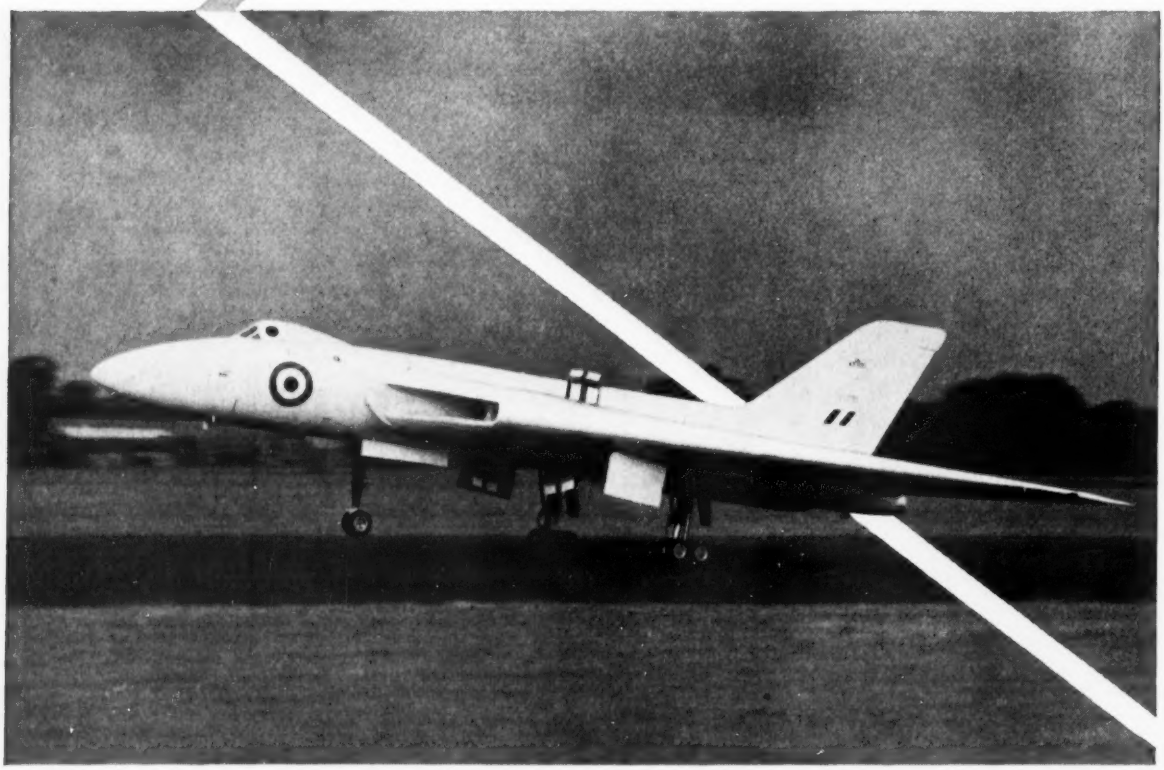

FLIGHT
and
AIRCRAFT ENGINEER

First Aeronautical Weekly in the World

Founded 1909

No. 2334 Vol. LXIV. FRIDAY, 16 OCTOBER 1953

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Telegrams Flightpres, Sedist, London.
Telephone, Waterloo 3333 (60 lines).

Branch Offices:

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Proof of Performance

THE interest shown by the general public in the England-New Zealand Race has been most gratifying. To the ordinary being it must have seemed all rather strange and complicated, for many of the normal elements of such a contest were absent. The competitors who remained, after several disappointing withdrawals, took off singly at intervals; some followed different routes; the prizes had little or no part in the competitors' considerations; nor were the aircraft selected for their special suitability or the crews for their love of air racing. Yet race the Canberras certainly did, and this part of the competition at least could be understood and appreciated by everyone, even if, in the transport handicap section, the Viscount had to land at Christchurch before it had taken off from London if it were to beat the DC-6. Even in these days, when sonic fighters and jet airliners are becoming commonplace, to reach New Zealand from London in less than 24 hours elapsed time and at an overall average speed of practically 500 m.p.h., is indeed astonishing.

One heard questions as to the wisdom of entering a medium-range aircraft such as the Viscount in a race to which it was not well suited. But there was more to consider than handicap. The B.E.A. entry's highly creditable performance will, we have no doubt, reflect most favourably in many countries across the world—countries unfamiliar with the new British gas-turbine airliners. Here was a demonstration of reliability and speed in a great variety of climatic conditions. Thanks to its extra tanks the Viscount made some extraordinarily long flights (Cocos to Melbourne is 3,600 miles) and normally cruised at over 310 m.p.h. at upwards of 30,000ft. This over-most-of-the-weather flying will make an increasing appeal to discriminating air travellers; that the demonstrated actual cruising speed and the makers' claim turn out to be virtually identical will not escape the notice of operators, who often detect discrepancies in such matters.

The worthy old DC-6 lived up entirely to its good reputation and also displayed both reliability and speed in delivering its large load of immigrants safely and according to plan at Christchurch, winning both praise and the transport-section first prize of £10,000.

And what of the "hot rods"?—if we may refer to them so disrespectfully. As will be learned from our accounts on pages 521-523 and in earlier issues, the Canberras were standard except for minor details of equipment and long-range tankage. The British and Australian pilots and navigators were all picked men and all unlikely to make a mistake; and thus, as was expected, the race depended upon serviceability and quick turn-round at the far-flung stopping points. In their flying times the first four Canberras were astonishingly consistent. There was only eleven minutes' difference between them.

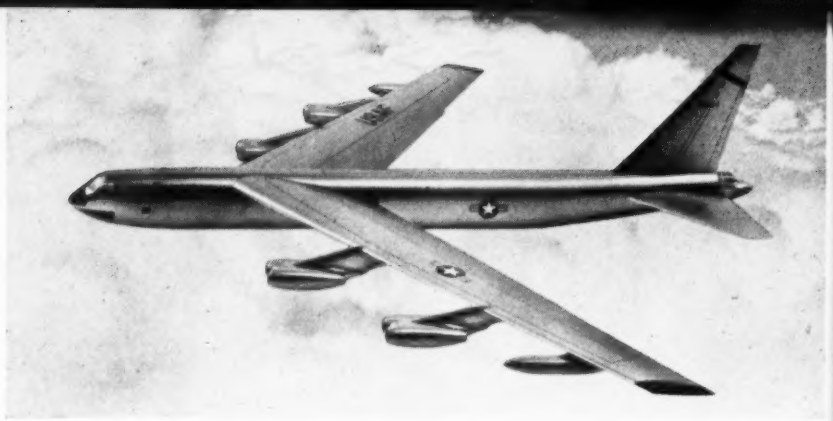
It would be true to say that while we are naturally delighted that F/L. R. L. Burton and F/L. D. H. Gannon won the speed race for England, everyone would have been very pleased to see any of the five Canberra crews in first. There were no mishaps and, as was expected, the Rolls-Royce Avon turbojets all kept turning and burning no more than their allowance of kerosine. (We cannot omit the information that the four Darts in the Viscount together completed 125 million revolutions during the race.)

Our hearts bled for the Wing Commanders Hodges and Cuming, who both did so magnificently as far as Perth and Cocos respectively and were then delayed by minor troubles. A black mark should be awarded to the men who in 1953 still design jammable fuel filler caps or to those others who let them remain on the R.A.F. Canberras for a race of this kind. Australia, incidentally, scored something of a moral victory by clipping several minutes off the R.A.F. refuelling time.

That height and range are not necessarily all-important in a race to New Zealand was indicated by W/C. Hodges' very long hop to Perth. On this he lost four minutes on Furze, who landed at Cocos and was then able to fly a fairly short, low leg at higher speed (though, no doubt, less economically). The Aussies' local knowledge, which led them to select Woomera for staging across their Continent, in fact appears to have lost them a minute or two—no doubt due to perverse winds.

All things considered, this latest long-distance race was a triumph for the makers of the Canberras and their turbojets; while these aircraft had no competition—and this was most unfortunate—by their individual performances each demonstrated its right to be classed as a winner.

FROM ALL QUARTERS



DECAPOD: A Boeing drawing of the B-52A Strato-fortress, to be produced in quantity at Seattle and Wichita. It has a new nose and crew compartment, with side-by-side seats for pilot and co-pilot, and tanks beneath the outer wings.

Hawker Siddeley Chiefs See U.S. President

"WE have exchanged ideas with our American friends, and I think we have started a number of things which will benefit both countries and both industries. Both the Air Force and the Navy here are very interested in our fighters and bombers, and it is certainly a rewarding experience to discover that British technological advances in air power immediately command not only wholesale respect but unfeigned admiration."

These words were spoken by Sir Frank Spriggs last week as his United States visit, in company with Sir Roy Dobson and the Hawker Siddeley design council, neared its end. The American visit was paid when the team was *en route* to Canada for discussions with the Canadian Government and heads of the aircraft industry.

The nature of the "number of things" remains an interesting subject for speculation until such time as security permits disclosures to be made. Certainly the mission was unique of its kind, especially as it culminated in the two British aviation chiefs being invited to the White House for a discussion with President Eisenhower; after the conference they left with Mr. Harold Stassen, head of America's Mutual Security programme.

Earlier, Sir Frank and Sir Roy, with various members of their council, had attended meetings with the Defence Secretary, Mr. Charles Wilson, and the Air Secretary, Mr. Harold Talbott. Other members of the mission conferred with their American opposite numbers, and the U.S.A.F. flew a team of their senior research specialists from Dayton, Ohio, to confer with the British delegation at the Pentagon under the chairmanship of General Craigie, who controls forward planning. Talks with the U.S. Navy were held in the office of Admiral John Souchek, Chief of the Naval Bureau of Aeronautics. Throughout the visit the Britons were besieged by eager newspapermen, and at a meeting of the Aviation Writers' Association 70 members subjected them to a barrage of questions about the Hunter, Javelin and Vulcan.

As was to be expected, the visitors were guarded in their statements. Sir Frank Spriggs said "We are here to discuss . . . new versions of piloted and pilotless planes, guided and unguided missiles, and engines with power which makes present engines look a bit silly." He added that, so far, he was very satisfied with the exchange of information on missiles. There had been no exchange on nuclear-powered aircraft—"we are not in that field at the moment."

On October 8th the party left by air for Canada. Their arrival in America, three days earlier, had been threatened with delay when the *Queen Mary* was diverted to Halifax by the New York Dock strike, but Avro Canada sent two DC-3s to fly them through to New York. Incidentally, the visitors had arrived at the White House in highly appropriate style; they rode in a convoy of Armstrong Siddeley Sapphire cars.

Members of the mission include Sir Sydney Camm, Hawker director and chief designer; W. G. Carter, Gloster technical director; S. D. Davies, Avro chief designer; Sir William Farren, Avro technical director; W. H. Lindsey, Armstrong Siddeley director and chief engineer; J. Lloyd, Armstrong Whitworth technical director; W. J. Newman, A.W.A. armaments division chief engineer; W. F. Saxton, A.S. director and general manager; and H. R. Watson, A.W.A. aircraft chief designer.

Australia's Production Problem

ALTHOUGH, as Mr. Duncan Sandys said after his recent visit, "Australia has laid firm foundations for a great aircraft industry," some uneasiness is being felt about the Commonwealth's jet aircraft production programme, on the score of both cost and delivery dates.

Reviewing the current position, the Australian Cabinet committee working on defence problems are reported to have shown anxiety over the cost of the Canberra and Avon-Sabre programme. It is also felt that by the time the 48 Canberras and 72 Sabres are eventually delivered to the squadrons they will be obsolescent. The committee now has to decide whether Australia can rely on her own industry as the principal source of equipment for the R.A.A.F., or whether it would be advisable to buy the latest aircraft from abroad. Spokesmen of the R.A.A.F. have stated that it would be unwise to rely on the U.K. or the U.S.A. for first-line aircraft once an emergency had arisen.

First Civil W.S.55 Delivered

FOLLOWING successful experience with aircraft, and lately more particularly with helicopters, a number of whaling companies are now interested in the S-55. The first civil Westland-Sikorsky 55 (600 h.p. P. and W. Wasp) was delivered recently to a Norwegian company who had previously used S-51s. The 55 carries more equipment and has a greater endurance, and this particular version has extra tanks and radio equipment. It is learned that one of the advantages of the helicopter over the fixed-wing machine is that it is easier to fly slowly and count the whales in a school. The principal advantage is, of course, that the helicopter can take off from and land on the mother ship.

"Fixed wing" news from Yeovil concerns the Westland Wyvern 4, recently introduced into squadron service and readily accepted by Navy pilots. A new series of deck-landing trials is about to start. It may be recalled that in June 1949, the Mk 1 became the first aircraft to do 100 consecutive deck landings on its first trials, all in two days. In June 1950, the Mk 2 did a short period of carrier trials during which 25 landings were successfully completed.

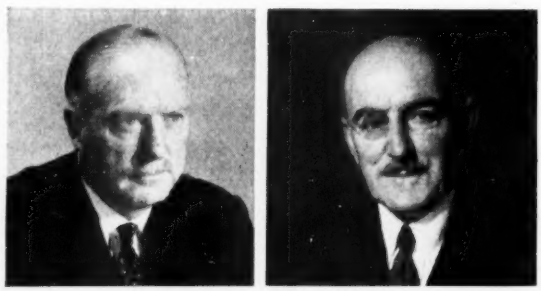
Air and Sea Transport Partnership

THE growing interest of the shipping industry in the possibilities of free-enterprise air transport is emphasized by the announcement, made in London last Tuesday, of an agreement between the Clan Line Steamers, Ltd., and the Hunting Group, who, in addition to their aviation and oil activities, have important shipping interests (as ship-owners, they claim to be the leading British independent tanker owners).

Under the agreement, a holding company, to be known as Hunting-Clan Air Holdings, Ltd., will be formed, with initial capital of £1m, to take over the whole of the share capital of Hunting Air Transport, Ltd., and Field Aircraft Services, Ltd. The air-transport company will in future operate under the title of Hunting-Clan Air Transport, Ltd.

The Clan Line group of companies owns 57 vessels totalling about 600,000 tons, mainly engaged in the carriage of general cargo over a network of routes within the Commonwealth and Empire.

Mr. P. Ll. Hunting is to be chairman of the new holding company. Lord Rotherwick and Sir Nicholas Cayzer, Bt. (respectively chairman and vice-chairman of the Clan Line Steamers, Ltd.) will be members of the Board, together with Mr. G. L. Hunting (vice-chairman of the Hunting Group), Mr. C. P. M. Hunting, Mr. L. C. Hunting, the Hon. Anthony Cayzer, Mr. R. R. S. Cook and Mr. J. A. Thomson. The two operating companies will continue under their present management, their Boards being strengthened by the addition of Clan Line representatives.



Mr. P. Ll. Hunting (left) and Lord Rotherwick.

The pre-race line-up at London Airport's central area. "Flight" photograph

ENGLAND TO NEW ZEALAND

—*in 24 Hours: Varied Fortunes in the London-Christchurch Race*

FIRST aircraft to arrive at Christchurch and so win the speed section of the England-New Zealand air race was the Canberra P.R.3 flown by F/L. R. L. E. Burton and F/L. D. H. Gannon, which crossed the finishing line only 23 hours 51 minutes after taking off from London Airport. The average speed achieved, 494.5 m.p.h., has been announced by the Royal Aero Club as a new point-to-point record, subject to confirmation.

Second was the Australian Canberra B.20 flown by S/L. P. F. Raw, F/O. F. N. Davis and F/L. W. D. Kerr, whose total elapsed time was 24 hours 32 minutes, and third was the remaining P.R.3 Canberra flown by F/L. R. MacA. Furze and F/L. J. W. Harper. The Canberra P.R.7 flown by W/C. L. M. Hodges, after flying non-stop from Colombo to Perth (omitting the Cocos Islands stop) was grounded there due to generator and filler-cap trouble, and so dropped back into fourth place.

Leading in the penultimate stage of the race was the Australian Canberra of S/L. Raw, which, heading for Woomera, was the first aircraft to cross the Australian coast. A previous casualty at the Cocos Islands had been W/C. Cuming in the other Australian Canberra which, while in the lead, had burst a tyre on landing.

A delay was experienced at Woomera by S/L. Raw, who was forced to land with his Canberra's nosewheel only half-way down. On landing, the pitot head was damaged, and the time required for the necessary repairs enabled F/L. Burton in the British machine to take the lead.

Other records obtained were: London-Basra, F/L. Burton at 543.9 m.p.h., and London-Colombo, W/C. Hodges at 519.5 m.p.h.

In the transport handicap section, the first arrival at Christchurch was the B.E.A. Viscount *Endeavour*, 40 hours 41 minutes after leaving London. Outstanding were its long stages from London to Bahrein (3,218 miles) and from the Cocos Islands to Melbourne (3,600 miles). On the whole trip, according to a message from Mr. Peter Masefield at Christchurch, no snags were experienced—a fine tribute to an excellent aircraft.

The Viscount remains basically, however, a relatively short-range aircraft, and so under the race handicap formula could not be expected to show up well in comparison with the 64-passenger carrying DC-6A entered by K.L.M. The DC-6A took 49 hours 57 minutes for the flight to Christchurch (the handicap allowance reducing this to what the organizers call a "net time" of 5 hours 28 minutes), and thus won the first prize in this section of the race. The R.N.Z.A.F. Hastings was forced to withdraw from the race in Colombo due to a damaged engine (engine replacement not being allowed under the race rules).

The fastest crew: F/L. R. L. E. Burton and his navigator, F/L. D. H. Gannon, whose Canberra P.R.3 completed the course at an average speed of 494.5 m.p.h. (based on the direct Great Circle distance).

A detailed account of the preparations for the race and of the progress of each aircraft follows.

Preparations for the Start.—At London Airport the eight competing aircraft had been on public view in the central area for the three days preceding the race. Access to the area was by way of the 2,060-ft tunnel which runs from the Bath Road under No. 1 runway and which was open to the public for the first time on Monday, October 5th; for the period of the race preparations

Winner in the transport handicap section was, as expected, K.L.M.'s DC-6A. Crew members (left to right): 2nd R/Off. J. van den Bos; 2nd/Off. P. J. Aarts; 1st R/Off. J. M. C. Kiepe; 3rd/Off. J. Noomen; Capt. H. A. A. Kooher; 1st/Off. J. F. Griffith; 1st F/Engr. H. van der Ham.

ENGLAND TO NEW ZEALAND . . .

and the start the public enclosure had been transferred to the central area. That these facilities were not available during the previous week-end was indeed a disappointment to the thousands of people who journeyed to the airport on Saturday and Sunday and crowded the Bath Road enclosure in an endeavour to see something of the racing aircraft.

Crowds were smaller, though by no means inconsiderable, during the week. On the Monday, the transport-handicap entrants were weighed and details of payload checked prior to the calculations of the actual handicap speeds and times for the three machines. It came as no surprise on Wednesday when it was announced that B.E.A.'s Viscount, scratch machine, had been sentenced to a handicap speed of 584.36 m.p.h., compared with 182.38 m.p.h. (with a handicap allowance of 44 hours, 30 minutes) for the DC-6A entered by K.L.M. The turboprop machine's 5,862 lb race-payload, out of an all-up weight of 62,000 lb, showed up badly against the 31,826 lb payload of the long-range DC-6A (105,533 lb all-up weight). The R.N.Z.A.F. Hastings (83,000 lb all-up weight, 21,357 lb payload) was allotted a handicap allowance of 35 hours with a speed of 213.75 m.p.h.

By Wednesday night—the eve of the race—practically all the preparations were complete, and the central area at L.A.P. presented a scene of unexpected calm. Powerful floodlights illuminated the line of competing aircraft—five small, purposeful Canberras, towering DC-6A, Viscount, and the Hastings, with distinctive tail-down attitude, all seen against a kaleidoscopic background of airport lights. Various stores were being taken aboard the Dutch airliner, and a few final items were being loaded on to its two rivals in the transport section, but the Canberras stood quietly alone and virtually unguarded.

On Thursday morning the central area atmosphere remained leisurely, although much behind-the-scenes work was being performed. Members of the public streamed steadily in to line the enclosure in front of the row of machines, ground crews checked their aircraft and the equipment to be carried, and the sun shone. Soon after the initial lunchtime met. briefing the competing crews arrived at the aircraft, their casual manner giving little indication of the arduous flight ahead.

Several details of technical interest were apparent, on the Canberras in particular. It had been known for some time that, assuming that all went well, one of the most important factors for winning the race would be reduction of refuelling time. The P.R.7 was liberally spotted with yellow paint, indicating the number of filler-points in fuselage and wings; there were no fewer than nine on the starboard side of the fuselage, high and at waist level, while numbers 10 and 11 were on the port side wing and 12 and 13 on the starboard. Many of the R.A.F. fillers were also conspicuously labelled "Fuel Avtur 100 only." The additional belly tanks could be seen in position when the bomb doors were open.

A quite different arrangement was employed by the Australian machines—with good effect, judging by refuelling times. On these two machines the bomb doors had been completely removed and the flush exterior surface to be seen comprised the actual walls of the tanks. The "keel" fairing beneath housed the pumps. The tanks themselves were supported by metal strips labelled "dry tension 16 lb ft."

Slight relaxation of security on the tarmac at London Airport permitted many spectators to peer inside the Canberras' crew compartments and in some cases actually to climb a step or two into them. So far as the R.A.F. machines were concerned there seemed to be very few alterations from standard. Compasses and artificial horizon of Sperry type appeared to be the normal equipment, and all the instruments in the Australian machines had been picked out in bright orange luminous paint. Each R.A.F. machine carried a Smith S.E.P.1 autopilot and two of the three had clearly visible in the transparent nose the "banana sight" and wires used on photographic work.

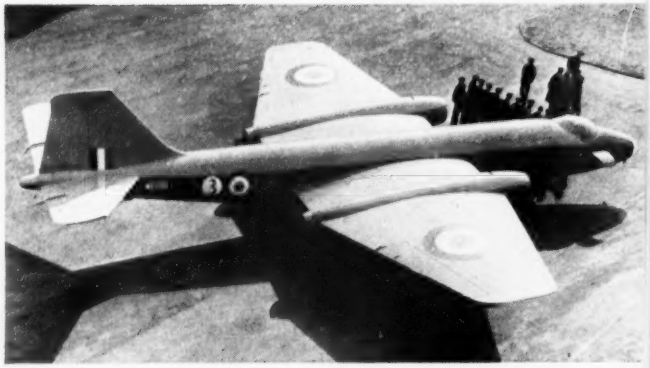
The Australian machines had a loop mounted in roughly the same place as the R.A.F. bananas and they also had D.M.E. equipment housed in the nose portion. Carrying two pilots and a navigator, they had no autopilot. Another difference to be noted in the Australian machines was that the aerial under the tail was faired in, and looked like a ventral fin.

The P.R.7 had noticeably different skinning at the rear end of the fuselage, and what appeared to be large stiffening plates had been added in side positions beneath the roundels and the racing numbers. Being a prototype, the machine may not be representative of production Mk 7s in this connection. Minor differences were noticeable around the nacelles of the R.A.7s, particularly in regard to the various ports.

The R.A.F. Canberras were liberally provided with static-discharge wicks on the trailing-edges of their control surfaces, but none was visible on the R.A.A.F. aircraft.

The DC-6A, we learned, was carrying the latest type of American Sperry A.12 autopilot and a Zero Reader.

An examination of the interior of the Viscount reinforced our



The winning Canberra P.R.3. After being delayed at Shaibah by brake trouble, Burton's machine went on to put up high average speeds over the final stages of the race.

First aircraft to leave London Airport was K.L.M.'s DC-6A (here being flagged away by H.R.H. the Duke of Gloucester) which "on the race formula" comfortably won the transport handicap section.

"Flight" photographs above

B.E.A.'s Viscount "Endeavour" prepares to take off. It arrived at Christchurch 9 hr 17 min ahead of its K.L.M. competitor.

The handsomely finished Hastings, entered by the Royal New Zealand Air Force, on the starting line. Trouble at Negombo, requiring a complete engine change, forced the machine to retire from the race.

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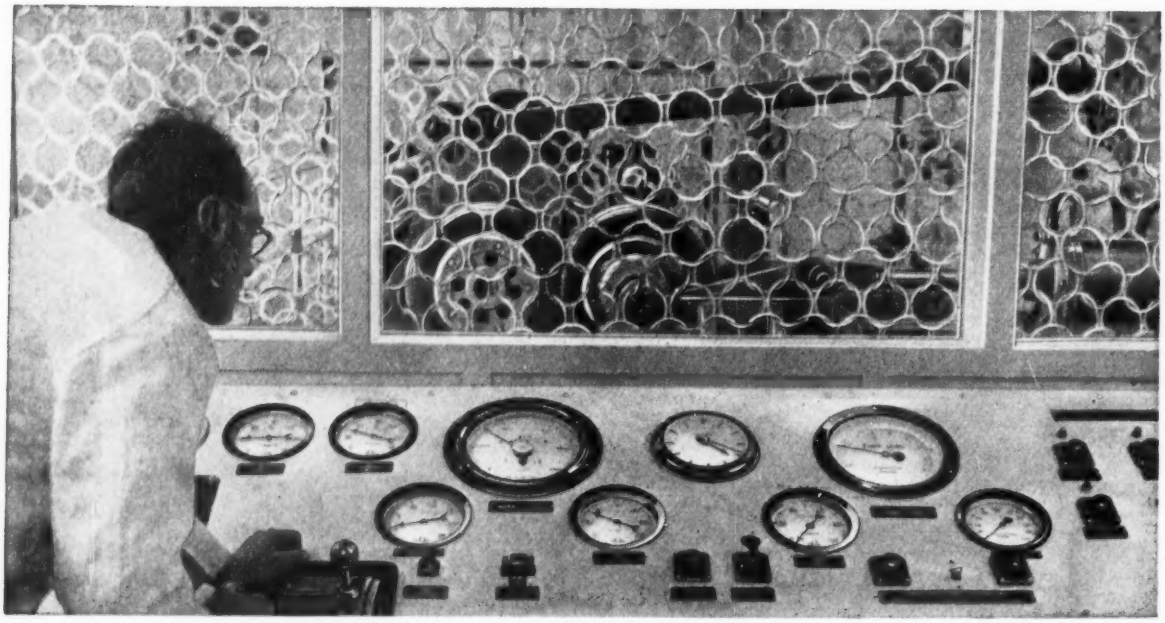
NEW TYRE-TESTING MACHINE REPRODUCES HIGH-SPEED JET OPERATING CONDITIONS

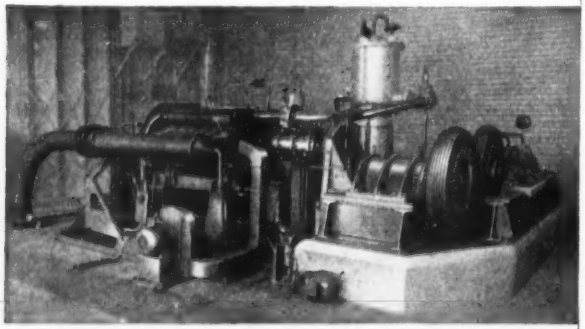


Controlling the progress of an actual test run. The machine can be seen through the double wall of safety glass, beyond the protective steel torpedo netting

PERMITS CLOSE, ACCURATE STUDY OF AERO TYRE BEHAVIOUR

The startling progress of aeronautical design in recent years, so greatly influenced by the development of the jet engine, has confronted the tyre designer with complex problems. Thinner wing sections, which reduce retraction space, create a need for smaller-section tyres. But they also indicate higher performance—and a correspondingly bigger strain on wheel equipment. Just how successfully Dunlop has overcome these problems may be judged by the wheel equipment now fitted to the "Comet," the "Viscount" and many other advanced Civil, Military and Naval aircraft.

An indispensable aid in all this work is test equipment capable of simulating actual operating conditions—both as they are now and as they are likely to be in the future. Here Dunlop has a unique advantage—a test machine that reproduces, for close and accurate study, the complete life-cycle of a high-speed jet aircraft's tyre. Mounted in a specially-constructed, well-protected building, the new plant is powered by a Rolls-Royce Merlin aero engine developing 1,725 b.h.p. at 3,000 r.p.m.—equivalent, with some tyres, to a surface speed of 300 m.p.h.



The test plant, showing the Merlin engine, the test-tyre and, on the far side, the 'slave' tyre and pneumatic ram.

Sudden Strains and Stresses

To reproduce the effect of a loaded tyre travelling over a flat surface, the test tyre is driven against a freely-rotating tyre "spring-loaded" by means of a compressed air cylinder. To imitate a take-off the driven tyre is rapidly accelerated under a gradually-reducing load. For landing, the tyre is rotated at high speed and the 'slave' tyre is pressed suddenly against it under a load of up to 7½ tons. This load is then momentarily withdrawn, to simulate landing 'bounce', and then re-applied for a longer period in imitation of the taxying run. The whole sequence of operations is automatically timed and controlled.

This new machine is undoubtedly a complete step forward in aero tyre testing. Already it has yielded information which is readily translatable into terms of safer, more economical aircraft operation. This valuable data is now being applied in Dunlop designs. By anticipating the needs of the future in this and many other ways Dunlop offers a complete service to the Aircraft Industry.

DUNLOP **RESEARCH** SERVES THE AIRCRAFT INDUSTRY—*Manufacturer, Operator, User*

2H/616

ENGLAND TO NEW ZEALAND . . .

impressions that the extra fuel tanks were very neatly constructed, comprising fabricated light-alloy boxes containing Marston bag tanks of 1,300 gallons. They are refuelled *via* pipes leading through oval panels fitted in place of windows on each side. Mattresses lay on top of the rear tanks, and the navigator made use of a further portion of the forward tank tops while seated behind a folding table in the gangway between them. Cigarettes and Vichy water were conspicuous among the ship's stores, and a fair-sized bundle of envelopes was carried for philatelists.

The R.N.Z.A.F. Hastings looked (as, in fact, it was) straight from the makers' hangars—though, of course, prior to Handley Page attention it had flown from New Zealand for the race. The interior was full of many types of gear and equipment, but the pairs of rearward-facing seats looked comfortable enough.

The Start.—Shortly after three o'clock the Duke of Gloucester, who was to start the race, arrived at the line of aircraft accompanied by senior M.T.C.A. and Royal Aero Club officials. He was introduced to the crew members of each machine in turn and inspected each aircraft at the captain's invitation, beginning with the B.E.A. Viscount, and its immaculate white-rayon-gaberdine-overalled crew. The likewise efficient-looking crew of the DC-6A (who had just before been talking with Dr. Plesman, K.L.M.'s president) were next, followed by those of the R.N.Z.A.F. Hastings, the Canberra P.R.7, the two P.R.3s, and the two Australian-built Australian-manned Canberras. A last-minute alteration in the crew of the R.A.F.'s No. 2 Canberra was the substitution of F/L. Furze for S/L. Press, who, unluckily, was suffering from a cold.

At 3.30, K.L.M.'s 64 paying emigrants boarded their DC-6A, and half an hour later the Viscount began to taxi out to the holding area near the end of No. 5 runway, followed by its two competitors. At 4.30 precisely the race was on: K.L.M.'s *Dr. Ir. M. H. Damme* (racing No. 21) was flagged away from the starting line by the Duke of Gloucester and accelerated along the runway, becoming airborne opposite the Royal Aero Club enclosure, just past the runway intersection. Five minutes later, the Hastings followed, taking a slightly longer run. Last contestant in this section was B.E.A.'s *Endeavour* which, with navigation lights on, took the longest length of runway before rising slowly, turning to port, and setting an easterly course.

In the 55 minutes pause before take-off time for the first Canberra, all five machines were positioned near the starting line and topped-up with fuel. Dusk was falling as the attendant bowsers completed their chores, moving from aircraft to aircraft and then disappearing behind the old Fairey hangar.

At 5.35, the first Canberra began to roll, a green-tipped dark shape which slowly gathered speed and then rapidly approached—Hodges' light-grey P.R.7, strongly favoured to win and, like the Viscount, using most of the runway before rising from it. At five-minute intervals the Canberras took off; Furze lifting a nose-high No. 2 in the shortest take-off of all, Burton in No. 3 wasting no time in an early low turn on to course (as London Airport's normal activity continued with a Swissair DC-4 taking off from runway No. 1). The Australian machines followed, nav. lights flashing; Cuming banked No. 4 round low, and finally Raw in No. 5 took off westwards into the dull red sky and, turning, disappeared into the grey darkness of an autumn night.

With each aircraft had gone the wishes of all on the ground at L.A.P. for a safe journey on the 12,000-mile flight. It was later that night that news of progress began to come in. Information contained in reports subsequently received at race Headquarters and *Flight*'s offices is given below (all times are G.M.T.).

SPEED SECTION

R.A.F. Canberra P.R.7. Racing No. 1. Pilot W/C. Hodges.—Take-off London 1735 hr. Shaibah 2248; 30 min turn-round; take-off 2318 (filler-cap fault). Landed Negombo, Ceylon, 0400; 17 min turn-round; take-off 0417. Overflew Cocos, overhead at 0726. Landed Perth 1102. Unable to take-off due to generator trouble and to damaged filler-cap. Landed Christchurch 35 hr 25 min after leaving London. *Placed fourth.*

R.A.F. Canberra P.R.3. Racing No. 2. Pilot F/L. Furze. Take-off London 1740 hr. Landed Shaibah 2305; 72 min turn-round; take-off 0017 (delay due to turbo-starter change). Landed Negombo 0509; 26 min turn-round; take-off 0535 (main wheel changed). Landed Cocos 0853; 11 min turn-round; take-off 0904. Landed Perth 1214; 11 min turn-round; take-off 1225. Landed Christchurch 1815. Elapsed time 24 hr 35 min; overall average speed 500 m.p.h. Airborne time 22 hr 35 min (speed 545 m.p.h.). *Placed third.*

R.A.F. Canberra P.R.3. Racing No. 3. Pilot F/L. Burton.—Take-off London 1745 hr. Landed Shaibah 2257; 30 min turn-round; take-off 2327 (after brake repairs). Landed Ratmalana (Ceylon) 0434; 14 min turn-round; take-off 0448. Landed Cocos 0804; 22 min turn-round; take-off 0826 (delay due to fuel hose bursting and drenching aircraft, which then had to be dried out). Landed Perth 1136; 18 min turn-round; take-off 1154. Landed Christchurch 1737. Elapsed time 23 hr 51 min. Overall average speed 515 m.p.h. Airborne time 22 hr 27 min. (Speed 546 m.p.h.). *Placed first.*

R.A.A.F. Canberra B.20. Racing No. 4. Chief Pilot W/C. Cuming.—Take-off London 1750 hr. Landed Bahrein 2350; 12 min turn-round; take-off 0002; landed Ratmalana 0419; 13 min turn-round; 0432 take-off; landed Cocos 0744 (in the lead); burst tyre on landing; flew on to Christchurch *via* Melbourne on October 12th, arriving 80 hr 9 min after leaving London. *Placed fifth.*

The Australian crew whose Canberra led over most of the race, but which was delayed at Woomera. Left to right: S/L. Peter Raw, F/O. Francis Davis, and F/L. William Kerr.

R.A.A.F. Canberra B.20. Racing No. 5. Chief Pilot S/L. Raw.—Take-off London 1755 hr; landed Bahrein 2344; 15 min turn-round; take-off 2359; landed Ratmalana 0418; 15 min turn-round; take-off 0433; landed Cocos 0752; 10 min turn-round; take-off 0802 (fastest turn-round of the race); landed Woomera 1258; 83 min turn-round; take-off 1421 (delay due to oxygen trouble, also nosewheels collapsed and pitot head had to be replaced); landed Christchurch 1827; elapsed time 24 hr 32 min; overall average speed 501 m.p.h.; airborne time 22 hr 29 min (speed 546 m.p.h.). *Placed second.*

TRANSPORT HANDICAP SECTION

K.L.M. DC-6A. Racing No. 21. Chief Pilot Capt. Kooper.—Take-off London 1630 hr. Landed Rome 1934; 22 min turn-round; take-off 1956; landed Baghdad 0225; 15 min turn-round; take-off 0240; landed Karachi 0802; 25 min turn-round; take-off 0827; landed Rangoon 1540; 36 min turn-round; take-off 1616; landed Jakarta 2253; 25 min turn-round; take-off 2318; landed Darwin 0601; 25 min turn-round; take-off 0526; landed Brisbane 1250; 37 min turn-round; take-off 1327; landed Christchurch 1827. Elapsed time 49 hr 57 min; overall speed 259 m.p.h. Airborne time 46 hr 52 min, speed 276 m.p.h. *Placed first.*

R.N.Z.A.F. Hastings. Racing No. 22. Chief Pilot W/C. Watson.—Take-off London 1635 hr; landed Athens 2224; 21 min turn-round; take-off 2245; landed Shaibah 0406; 30 min turn-round; take-off 0436; landed Masirah 0830; 25 min turn-round; take-off 0855; landed Negombo (No. 2 engine failure forced aircraft to retire from the race).

B.E.A. Viscount. Racing No. 23. Chief Pilot Capt. Baillie.—Take-off London 1640 hr; landed Bahrein 0252; 14 min turn-round; take-off 0306; landed Negombo 1107; 19 min turn-round; take-off 1126; landed Cocos 1750; 22 min turn-round; take-off 1812; landed Melbourne 0428; 15 min turn-round; take-off 0443; landed Christchurch 0921. Elapsed time 40 hr 41 min. Overall speed 301 m.p.h. Airborne time 39 hr 31 min. Speed 311 m.p.h. *Placed second.*

CONTRIBUTIONS TO SUCCESS

FOLLOWING the dictum that the whole is equal to the sum of the parts, many firms in the aircraft and ancillary industries, quite apart from those directly engaged in the manufacture of the successful engines and power-plants, deserve congratulations on the outcome of the race.

Pending receipt of further information, several such contributors may be referred to here. **Smiths Aircraft Instruments, Ltd.,** for example, were responsible for a great deal of the instrumentation and other equipment used in most of the competing aircraft. The Viscount had an S.E.P.1 autopilot and 40 other Smith items, including the Kelvin Hughes instruments mentioned below (the firm is a Smiths' associate); the R.A.F. Canberras used S.E.P.1 autopilots and Waymouth fuel contents gauges; and for the R.A.A.F. Canberras Smiths and/or their associate companies supplied all the instrumentation. **K.L.G.** igniter plugs and thermocouples were installed in the Avons of the R.A.F. Canberras, and K.L.G. thermocouples in the Darts of the Viscount.

The Sperry Gyroscope Co., Ltd., were able to claim that all the competitors used Sperry instruments, the comprehensive equipment of the DC-6A including a Sperry autopilot; and to the Viscount the firm of **Kelvin and Hughes** contributed a GM2B and P.11 compasses, periscopic sextant, rate-of-climb indicators, altimeter, synchroscope and engine tachometers and generators.

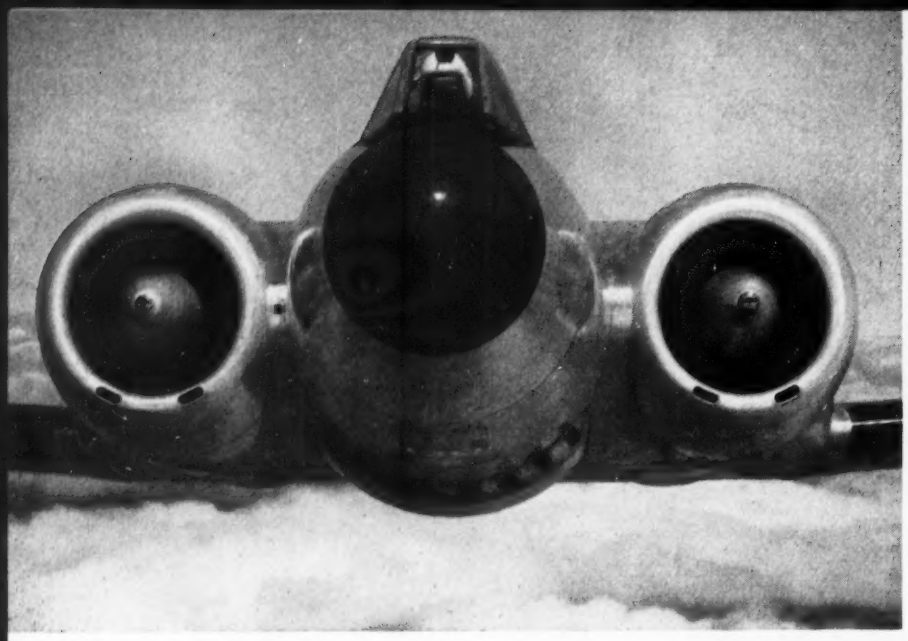
Lucas and **Rotax** equipment was used by the majority of the entrants, while **Normalair, Ltd.,** could claim that the "Canberras were Normalaired all the way."

Dunlop tyre, wheel and brake equipment figured in all the British and Commonwealth entries, two Canberra nosewheels being the only exceptions; and the Dunlop Maxaret braking system was used on the Viscount and on W/C. Hodges' Canberra.

Efficiency of ground equipment was an extremely important factor, and in this connection it is worthy of mention that **Thompson Bros. (Bilston), Ltd.,** supplied 22 of their new 2,500-gallon pressure refuellers for use at airfields along the course; the M.o.S. order was received last December, when the prototype was undergoing only initial tests, but the 22—a special advance consignment from a large contract—were delivered by the end of May for shipment abroad by the R.A.F.

A similar rush order was fulfilled by two factories of the **David Brown Group,** who had been working on a contract for 200 cast-steel aircraft-jack components for the English Electric Co., Ltd. Co-operation between the Group's foundry and tractor companies resulted in accelerated delivery of 12 sets.

The majority of the competing crews carried **Ever Ready** rubber torches and Ever Ready batteries were used by **Pye Telecommunications** for operating their walkie-talkie and other airfield equipment.



SONIC MONSTER: From this aspect the Avro Canada CF-100 appears so bluff and bulky that it is hard to credit its proved supersonic capabilities. The example pictured in this striking close-up is a Mk 3 machine, with eight 0.50in guns in the belly. It is on the strength of the CF-100 O.T.U. at North Bay, Ontario.

HERE AND THERE

A New A.T.A.F.

A NEW Allied Tactical Air Force came into being on October 14th; with Headquarters at Izmir, Turkey, and under the command of Maj. Gen. Eaton, U.S.A.F. It is known as 6th A.T.A.F. Component formations, provided by Greece and Turkey, are destined to support Allied Land Forces, South-Eastern Europe.

Aircraft for the Royal Tour

SPEAKING in Montreal on October 7th, Sir Miles Thomas described rumours that the Queen might use a Comet for her Commonwealth tour next year as "uninformed nonsense." He said that Her Majesty would fly to Bermuda in a Stratocruiser—"this route has not yet been tested for the Comet."

B.B.C. British Air War Film

LUFTWAFFE films of raids on London, and German pictures of R.A.F. raids on Hamburg, are to be included in a B.B.C. television film series on air warfare, to be broadcast in the winter of 1954-55. Air Chief Marshal Sir Philip Joubert will be technical adviser during preparation of the series.

The Pioneers Move In

PRESTWICK Pioneers, recently adopted for service in Malaya, are now undergoing trials near Singapore. Two have been assembled at R.A.F. Station Seletar and two more are expected to arrive from Scotland before the end of the year. They will be used principally for communications and casualty-evacuation duties from airstrips used in the fight against the Communists.

Cierva Prize Essay

THE Helicopter Association of Great Britain has issued rules for the 1953 Cierva Memorial Prize essay competition. Prizes of £35 and £15 are offered for technical essays on selected aspects of rotating-wing flight. Entry is not restricted to Association members, and entrants may be of any nationality; but—to encourage the younger generation—they must be under 25 at the closing date, December 31st next. Details are obtainable from the Association, at Londonderry House, Park Lane, W.1.

Mr. "Jock" Simpson

VICE-PRESIDENT of the Long Beach Division of Douglas Aircraft, Mr. "Jock" Simpson, died at Santa Monica on October 5th, at the age of 54. The son of an Orkney crofter, he served in the R.F.C. and R.A.F. during World War I, then emigrated to America. He has held increasingly responsible posts at the Long Beach plant, which today employs 30,000.

P/O. (Mrs.) Willis

WIFE of Mr. C. H. Willis, who is hon. treasurer of the Guild of Air Pilots and Navigators, and himself a practising V.R. pilot, Mrs. "Benny" Willis recently became the second Englishwoman to receive her R.A.F. wings. The instructional course that she took was one composed of University students, at Feltwell; she was the only woman on the course, and she passed out ninth from a total of 20. Mrs. Willis served in the A.T.A. during the last war, and has flown something in the region of 50 different aircraft types. She holds the rank of pilot officer, and she and her husband are the only man and wife commissioned in the Reserve. They have four children.

Swiftly Home

ON Thursday of last week Lt.-Cdr. Lithgow flew the Swift F.4 back from Libya, landing at Chilbolton an hour earlier than expected. Some further notes on his speed-record flights appear on page 540 of this issue.

Dowty Canadian Expansion

ON Tuesday last, October 13th, the new Dowty factory at Ajax, Ontario, was due to be formally opened by A.V-M. D. M. Smith, Canadian Air Member for Technical Services. Some 150 visitors were afterwards to be entertained by Mr. G. H. Dowty (chairman) at a reception at the Royal York Hotel, Montreal.

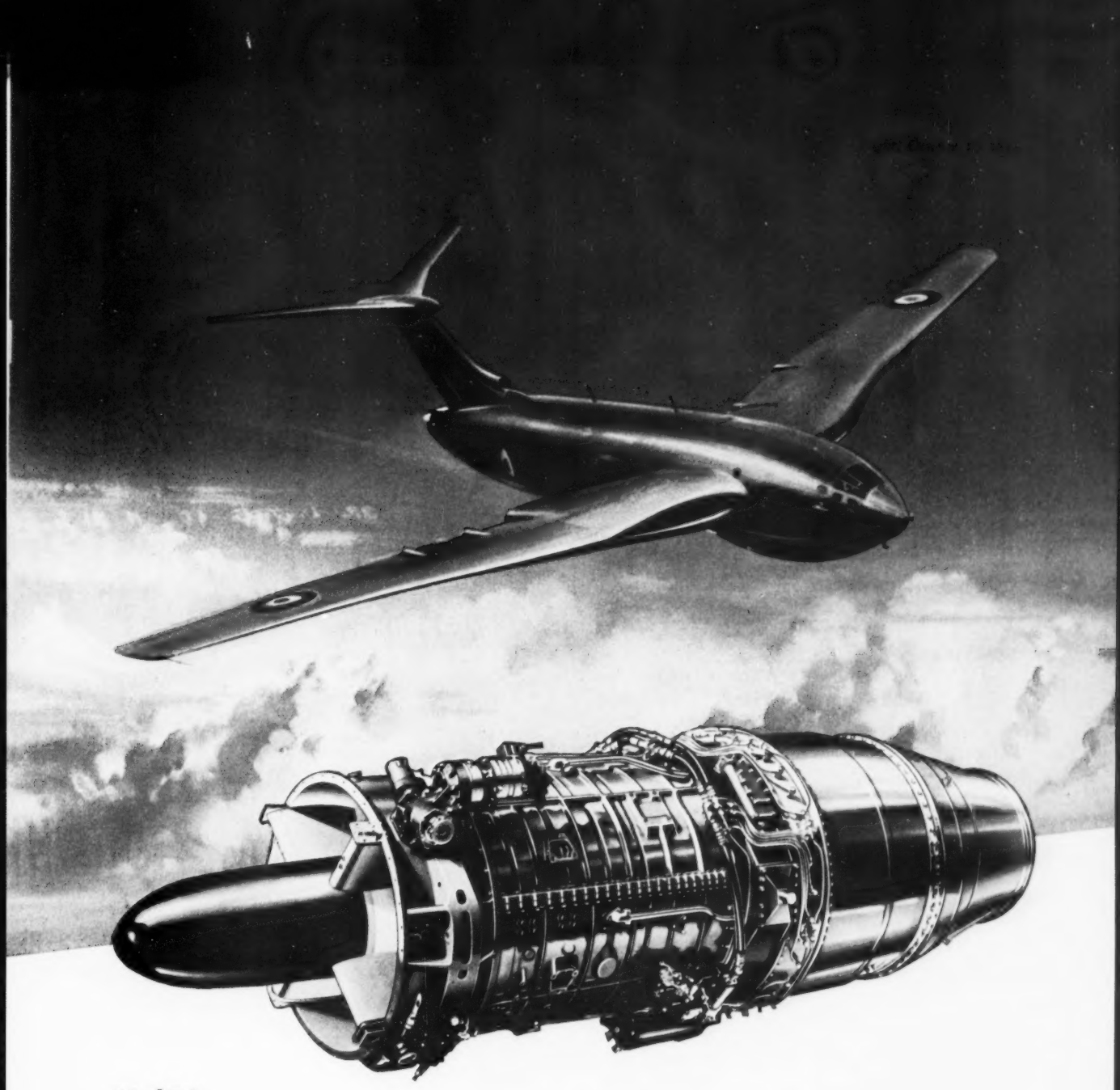
Mr. Jablonsky Claims Again

MEMBERS of the Royal Commission on Awards to Inventors learned details of D. H. Mosquito construction when, last week, they heard claims by Mr. Bruno Jablonsky and Jablo Propellers, Ltd., arising out of the use of "improved wood," initially (in 1935) for airscrews and later for airframes. In May this year Mr. Jablonsky was awarded £15,000 in recognition of his work on wooden airscrews.

Overload

PLANNING recent charter flights for American business and other organizations, Sabena arranged for their DC-6s to overfly Shannon on the westward trips, assuming that their passengers would want to reach home as soon as possible. In nearly every case the proposal brought emphatic protests; Shannon, it seems, is regarded as a refuelling stop—for whisky. On one flight, says Sabena, a party of 68 American telephone girls purchased over 250 bottles (at 10s. 6d. each—duty free).

DOWN—AND OUT: During his last-moment attempt to reach England in time to compete in the New Zealand Race, S/L. A. J. R. Oates, D.F.C., ran out of fuel and put down his Mosquito 41 on the Burma Coast. It was bitter luck for the pilot, who nevertheless deserves congratulations on a skilful forced landing. This photograph was taken in the Cocos Islands.



Victor
four Sapphire
crescent wing bomber

The Handley Page Victor, super-priority crescent winged bomber, is the latest addition to an impressive list of Sapphire-powered fighting aircraft. That the Victor employs four Sapphires is further evidence of the vitally important part this brilliant engine is playing in the air strategy of the Western Powers.

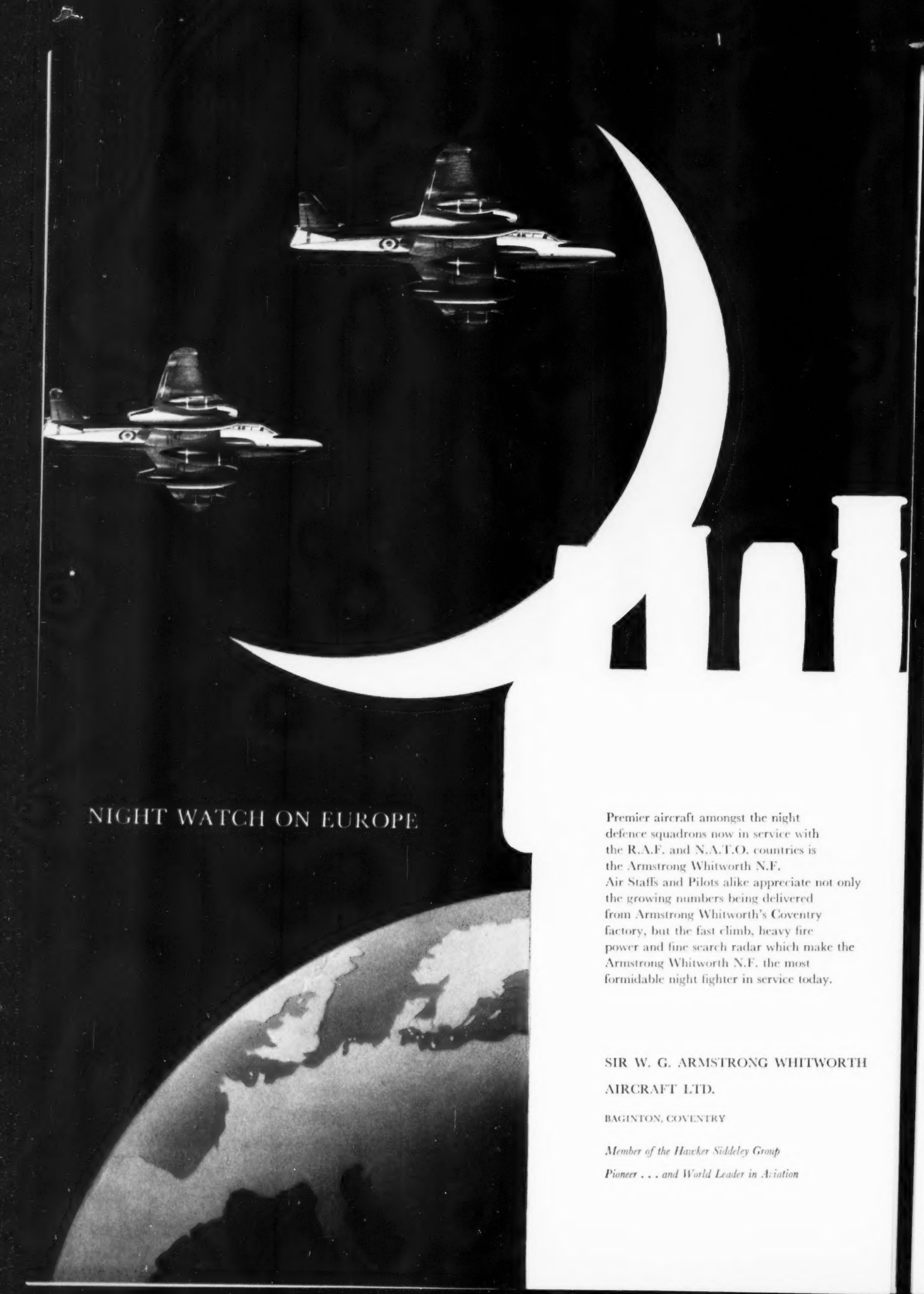
ARMSTRONG SIDDELEY

SAPPHIRE

TURBOJET

ARMSTRONG SIDDELEY MOTORS LIMITED • COVENTRY

Members of the Hawker Siddeley Group



NIGHT WATCH ON EUROPE

Premier aircraft amongst the night defence squadrons now in service with the R.A.F. and N.A.T.O. countries is the Armstrong Whitworth N.F.
Air Staffs and Pilots alike appreciate not only the growing numbers being delivered from Armstrong Whitworth's Coventry factory, but the fast climb, heavy fire power and fine search radar which make the Armstrong Whitworth N.F. the most formidable night fighter in service today.

SIR W. G. ARMSTRONG WHITWORTH AIRCRAFT LTD.

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PILOTS FOR THE AIRLINES

Whence Will They Come? A Current Problem and a Suggested Solution

By DAVID BRICE, A.R.Ae.S.

DAILY the problem of recruiting future airline pilot-material grows more acute. Discussion continues in both official and unofficial circles, but little of concrete value emerges. Captain Brice—a B.O.A.C. senior pilot of considerable experience—here examines the present situation, then goes on to formulate a scheme which he personally believes would give young men a start to careers in the Merchant Navy of the Air.

NO other group of men holds such a unique position in the airline business as the pilots. The other departments—traffic, commercial, engineering, operations and planning—all have vital rôles to play in the efficient running of an airline; but all their efforts are bent to but one end, that of ensuring that at the time of his departure the pilot has a serviceable aircraft, a commercially useful load to pay for the trip, and perhaps a bit left over for profit.

From that moment the pilot is on his own so far as responsibility is concerned. Whilst it would be foolish to insist that he can operate a modern aeroplane entirely unaided, the clear fact remains that the responsibility for everything that occurs during the flight is his.

On this account it is within his power to save his company a great deal of money by the straightforward and unhindered operation of his flight. By the same reasoning, it is also within his power to lose a large sum by failure to adhere to the correct operating procedures, by hesitancy to fly on meteorological grounds, by an over-zealousness on crew-fatigue matters, by an inadequate appreciation of the limitations of his aircraft, by being over-cautious or not cautious enough, by carelessness, or by the overwrought fear of taking a risk. By all these things he can be a liability to his company, and since all of them depend on the psychology of the man it is very much in the interest of any airline that it should take an interest in the make-up of a good pilot.

The pilot, too, is also the ambassador of his company, with a great responsibility of ensuring that the customers are content with what they are getting in the way of service or that, if they are unhappy, of seeing that their complaints are met so far as possible. There is almost nothing that those on the ground can do about these matters, since they very seldom hear all the facts.

The pilot is charged with the safe carriage of his load and here he is very much on his own; his crew can do little to help him. There can be only one master in an aeroplane, as in a ship; all the decisions, as well as the skill involved, must be left to one man, the captain. In short, the pilot can be said to be the focal point of an airline's endeavours and for this reason is a man to be chosen carefully and well.

With all these considerations it is strange indeed that no one in this country has developed a clear or precise idea of just where the next generation of airline pilots is to come from. Committees have sat, many are still sitting. The Government refuses to acknowledge the existence of any real problem, in spite of having the advice of a very well informed body, the Willcock Committee. The R.A.F. and the Navy would like to off-load their superannuated pilots on to the airlines, since they think the prospect might attract recruits. The airlines are leaving it to somebody else to sort out and the somebody elses are getting nowhere very fast, with Ministerial administrators passing the buck as fast as they can throw it.

In fact, nothing is really being *done*. It is my strong feeling it is time we got to grips with the matter and gave it some real consideration.

To my mind, as well as to many others who know the true facts, there is only one proper solution to the problem and that briefly is to get the men young, just after they have left school and train them over a period of years so that by the time they are in their early twenties they are in the cockpit, making their way towards the captain's chair. This can be the only way to deal effectively with this matter.

At first glance the idea that retired pilots of the R.A.F. and the Fleet Air Arm should go into civil aviation may seem to have a certain merit. Here are men, trained at the country's expense in the arts of flying, who are not old by normal standards; who are healthy; and who, but for the existence of the airlines, might have difficulty in finding suitable employment. So why not employ them and why not count on this as a solution to the problem of recruits for civil aviation?

The answers and the objections are several. To begin with—and I speak as an airline pilot—the idea that we are to be stocked by the rejects and the redundancies of the armed Services is one which tends to minimize the importance of the job at stake and as such is unacceptable to those of us who regard the business of taking off and landing an aeroplane as only one facet of an airline pilot's job. He is much more than just a driver.

It would be foolish to suggest that such material would be incapable of transformation into efficient airline pilots, and it is true that about 75 per cent of the existing airline pilots are ex-R.A.F.; but we are concerned here with the establishment of a proper basis for the recruitment of men into civil aviation so that it will be a counterpart to the Merchant Marine.

Apart from acquiring the ability to fly an aeroplane the man in the R.A.F. or the Navy learns practically nothing which will be of value to him in civil aviation. Indeed, he is liable to pick up a number of habits which, whilst virtues in a fighting force, become something of a problem in the more sedate atmosphere of commercial aviation. On this account, and because it is extremely unlikely that he will have accumulated any flying time on aircraft which bear any resemblance to the types he will now have to serve in (and because it is equally certain that he will have none of the necessary licences, be they pilot or navigation), it is highly probable that such a man would have to spend the first two years of his airline service in school. If this figure sounds exaggerated it might be pointed out that the B.O.A.C. Comet course lasts five months at least, and that a course for the Flight Navigators' Licence takes some six or seven months.

Apart from what the airlines might think, there is the equally pertinent question as to how the ex-Service man is going to view such prospects. Let's take a look at the situation as it is today. After the war there was a big influx of R.A.F. personnel into the airlines. Most of them came out of the Service with roughly equivalent qualifications, both in hours and in the licences which they subsequently obtained. At a loss to figure some equitable seniority system out of all this, most airlines adopted the principle of first come, first served; ranks and commands were handed out on this basis.

No one can say that such an idea did not work out as well as any suggested alternative. On the other hand, there is a good deal of criticism of the scheme from those pilots who got left on the side and who find themselves, after seven or eight years' service, with little or no immediate hope of getting a captaincy. Many of these men are in their middle thirties, with growing family responsibilities; and, knowing that their pension scheme is based on the premise of their obtaining the rank of senior captain, first class to get the maximum benefits, they see that the future is far from acquiring that rosy hue which should be their just dessert.

From this angle, then, consider the case of the flight lieutenant or flying officer who is coming out of the R.A.F. at the age of 27 or 28. He cannot be considered a very highly experienced pilot, but, on the other hand, he has been used to flying himself around the skies and is used to being an officer, if not of great importance at least of some account. He is offered a job as a 1st officer in an airline at (remembering all the perks and allowances of the Service) a lower salary than he was getting in the R.A.F. He is faced with a long term in the school with no positive guarantee that he will be able to attain all the necessary qualifications; and if he doesn't he will be out of a job. He is predestined to a period of from five to ten years in the co-pilot's seat, with a chance that he may never become a captain at all, since many men begin to feel the physiological strain in their middle forties and have to retire. He knows full well that if this happens to him his pension will be meagre and that his chances of getting a ground job within the airlines are remote.

Quite apart from the considerations already mentioned, it seems to me to be a highly risky business for airlines to rely on the Services for their recruits. There is no possible guarantee that in the year 1958 or 1963 the Services will be able to release sufficient pilot material to compensate civil aviation for normal wastage and expansion plans; the airline industry might well become hamstrung for lack of crews.

Civil aviation is too important to be reduced to the status of an ex-Servicemen's employment bureau. The Merchant Marine has never relied on the Navy for its recruits and there is no reason why the airlines should be forced into the position of handmaiden to the armed Services.

If this principle is accepted, it is for us to offer an alternative solution and, indeed, schemes to this end are now being worked out behind several shut doors.

It has been suggested that it is the Government's responsibility to provide a college for the training of future airline pilots. At

PILOTS FOR THE AIRLINES . . .

this suggestion the appropriate Ministries have all thrown up their hands in horror and almost turned out their pockets in their attempts to prove that no money exists for such purposes. The airlines have tended to shrug off the responsibility, and to some extent one can hardly blame them. The Guild of Air Pilots and Air Navigators and the British Airline Pilots' Associations have both got their committees on the subject. Somehow, out of all this, the right answer must come.

At this point I should like to make it abundantly clear that the suggestions and views which follow are essentially my own and should not be interpreted to be those of any other body or company with whom I am associated. They are the feelings of one airline pilot who takes a reasonable interest in the future of his profession.

As I see it there is no one simple answer; the solution lies in a reasonable spreading of the financial load among all the interested parties, not forgetting the man himself. In these days of social security, when such a high proportion of a man's earnings are taken away in the form of taxes to provide for his welfare willy nilly, the Government cannot absolve itself from all financial responsibility in the matter of providing recruits for civil aviation.

On the other hand, I feel that the establishment of a State-financed civil school in which a man would enter as a raw recruit and come out with several hundreds of hours in his log-book, is not yet opportune. The matter can be approached from a less ambitious angle and still fulfil its function.

For example, a college could be provided for recruits to enter on leaving school with a standard of education sufficient to ensure that they had a fair chance of obtaining the necessary qualifications. There is no reason why this school should not be integrated with some existing educational body so far as location is concerned, such as that which is already established at Cranfield. Where I differ from many who have advocated such schemes is that I feel that at this stage in the pupil's career the accent should be on ground training, with a corresponding lowering of the cost.

Moreover, I think it not unreasonable to expect parents to support some of this financial burden, just as they would if their sons were going to become doctors, barristers or architects. By all means let there be scholarships and other help from public-spirited men, who perhaps made their money from aviation. But I feel most strongly that we must not depend on philanthropy for our supply of pilots and that the profession must establish itself as one of sufficient merit to induce parents to select it as the right one for their sons, with consequent financial burdens at least in the initial stages.

Along with this thought that a college must be provided by the State goes the feeling that in so doing the Government must lay down the foundation for a Merchant Marine of the air. This school must teach its pupils more than just the fundamentals of the jet and the piston engine and how to operate the Loran and listen to a Consol Beacon. Here they must be taught the history of their profession, the geography of what they will see, the rudiments of the languages they will encounter, the art of public relations and the business of running an airline. It must be a school which will vie with other educational establishments as to its traditions, its sport and its achievements in the matter of sending young Englishmen into the world well equipped to do credit to their country. It must be a school to which boys will be proud to go, and to which men will cherish the thought of having been.

Suggestions for a Curriculum

It is my thought that boys will spend something like two years at such a school, in which time they will have done a very limited amount of flying but will have achieved a good standard of engineering knowledge; moreover, they will have passed all their technical examinations for the Flight Navigators' Licence. They will also have a good knowledge of the airline business and its opportunities for pilots and will to some extent have formed an idea in their mind as to which branch of the profession most interests them. An airline pilot's career does not necessarily imply service in one of the Corporations.

On the question as to exactly how much flying will be done during the two years, it is difficult to suggest an exact figure. Certainly the pupil will have reached the point where he can fly a light aeroplane unaided; and with all maintenance being done by the school itself the cost of operating a few Austers would by no means be excessive.

Another point which must not be forgotten (and I would stress that it is very easy to think in terms of the past and of how things *used* to be done) is that the introduction of synthetic trainers such as the Link and the Dehmel has completely altered the old conceptions of how much flying training a man requires to become an airline pilot. In the matter of air experience for navigators, for instance, there is no reason at all why a large proportion of training should not be carried out *en masse* in a synthetic trainer. All the problems which a navigator has to contend with in the air, such as cloud obstruction, poor radio reception, Loran failures and storm avoidance, can be synthesized to any required degree at an extremely low cost in comparison with the provision of the actual conditions in the air. A striking example, of which I have personal knowledge, is that with the aid of a Dehmel it is possible to convert a pilot to such a complicated aircraft as the Stratocruiser to such an extent that he needs but six or seven hours actual flying on the machine before being passed as fit to operate with a full commercial load.

Treated in this manner (though I agree it is only the beginning of the story) the problem of finding the money to support the flying-training programme becomes much less of a bogy. Here let me emphasize a point, one on which there is some confusion. The budding airline pilot of 20 or 21 who has spent the previous three or four years learning his profession does not have to have 1,000 hours in his log-book before he becomes employable. He doesn't even have to have 500 hours; and one can go a lot lower than that and still produce a man who is a useful crew-member even though he is a decade away from his captain's stripes.

After two years we should have a nineteen-year-old with about twenty or thirty hours' flying experience, a fair amount of time in synthetic trainers both on flying subjects and navigation, a good appreciation of what goes on under the cowlings and inside the airframe, and the right sort of academic background for his future career as an airline pilot. What are we to do with him then?

First, the airlines must be so interested in their own problem that they will agree to co-operate in future training plans. I am well aware that some are already interested, particularly the Corporations; but, so far, most of the endeavours are devoted to the training of those who are already almost in the co-pilot's seat. None of them, so far as I know—I admit being open to correction here—has as yet got down to doing something for the raw recruit.

The scheme that I now envisage would be an extension of the training programme, and as such would involve further financial outlay for the pupil or his parents, though not as much as it had done at the college. He would be seconded to an airline, not necessarily a Corporation by any means, and here he would work for a year as a cadet without salary. During this time the airline would be responsible for the furtherance of his training and, in return, the cadet would do such work as was reasonably fitting for a potential airline pilot. In other words, there would be no sweeping out of the hangar or serving the tea.

During this period the student would work his way through a laid-down curriculum which would include a proportion of flying, and it would be the airline's responsibility to ensure that such a programme was carried out. Whilst there is no doubt that the flying training would cost a certain amount of money, practically all airlines have their own schools and they are already committed to a fair expenditure on this account from the point of view of bi-annual checks and conversion programmes.

Seeing How It's Done

Apart from this, the airline would be getting the services of a man for a year without salary and that is worth something (if you can talk the trade unions into allowing it!) It must be remembered that here we are not concerned with teaching a man all about flying in a set period of time. He has no aerobatics to learn except for stall recovery, he has no bombs to drop with accuracy, and he has no low flying to master. His flying training with the airline can well start with going for the ride during check or test flights. At such times he has every opportunity for handling the aircraft even though it be a Constellation or a York, for except when a man is having his check or some particular manœuvre is being carried out, the automatic pilot is sure to be engaged; and it will willingly give up its flying time to the cadet. If this should seem like a pretty haphazard scheme, I must emphasize that the aircraft is probably just the type our cadet is eventually going to fly, and every minute that he spends at the controls is valuable from the point of familiarization with his job. His Link will have taught him the rudiments of instrument flying and on such flights as these he will have ample opportunity to put them into practice under the watchful eye of an experienced pilot.

By this method he will rapidly learn to live in an aeroplane, to work in it and become accustomed to it in every way and in every sort of weather. He will learn what the earth looks like at night from the air and what it feels like to fly through active cumulus. He will amass air experience far more valuable to him than could be gained from circuits and bumps in a Tiger Moth or cross-country flights in a Chipmunk.

From the nominal passenger-list the cadet can later get to the point where he is allocated a small proportion of the training-time scheduled for a particular flight, and during this period the instructor will go through many of the essential features of an airline pilot's flying duties. Admittedly, all of this is not going to be of much direct value to the man in the obtaining of his Commercial Pilot's Licence; but it *will* give him a very good background for the more specific flying which licence tests call for.

At this point his aim in life is to be a 3rd officer and his main function where large aircraft are used will be to fill, eventually, the position of navigating officer. Where smaller aircraft are used he will inevitably have to be carried as extra crew-member. To this some airlines may object on the grounds of loss of payload; but in most cases such loss will not be severe—and inevitably the training of an airline pilot must cost something.

A certain amount of work would be undertaken by the cadet in his first year whilst travelling as a supernumerary and as far as possible it would be of a navigational character. Where large aircraft are employed no problem would result, but where twin-engined equipment is used it would be more difficult. On the other hand, I can see no reason why, for the sake of a scheme such as this, there should not be sufficient co-operation amongst the airlines for an exchange of pupils for various details of their training programme.

All of these presupposes that the cadet has a definite status in the Merchant Air Service, that he will have his own uniform with appropriate markings of rank, and that he will be subjected to such discipline as has been found necessary with his counterpart in the Merchant Navy. On no account will he be just a dogsbody to be kicked around by anyone.

(*concluded at foot of opposite page*)

In the past 20 years Edward H. Heinemann has designed many outstanding naval aircraft, including the Skyrocket.

WE TALK WITH ED HEINEMANN

—about his Skyray and some other Douglas Designs

WHEN we heard recently that Ed Heinemann, chief engineer of Douglas, El Segundo, was in London, we lost no time in seeking him out. The purpose of his visit, he told us, was to serve on a committee convened by the M.o.S. and R.A.E. to sort out problems of stowage of weapons and stores on naval aircraft. Few people can know this subject better, for the El Segundo plant has almost certainly built more carrier-based attack aircraft than the rest of the world combined.

The talk, however, first turned to the F4D Skyray. We were surprised to learn that the design of this bat-winged intercepter goes back as far as 1945 when a U.S. Naval Intelligence team unearthed some of the original reports and studies of Professor Lippisch, the delta pioneer. The Douglas company quickly realized the improvement in drag-rise Mach number which would accrue from the adoption of this sort of layout and also saw that structural advantages and ease of accommodation might be obtainable. By coincidence the company were already studying Lippisch-type projects when the U.S.N. asked them to undertake the development of such a design.

The work proceeded throughout the late 1940s, the design being that of a fleet intercepter powered by a single large turbojet. The original delta approach was good subsonically, but test results were disappointing in the supersonic region. The profile was thinned down and the Douglas engineers eventually arrived at the optimum aspect ratio, taper ratio, thickness and profile. The present Skyray wing has a very low drag and a large chord to accommodate the landing gear and powered controls, while the short span results in rapid roll and easy stowage on board a carrier. Actually, it is more accurate to think of the wing as a conventional (non-delta) wing of low aspect ratio. At the roots the engine intakes grow from the leading edge with the main tankage "in the shadow of the ducts." The control system features elevons—capable of being used together or differentially as elevators or ailerons—and a conventional rudder. Speed brakes and slats are fitted, but the Skyray has no flaps. Landing speed is not unduly high, even at full load.

The first machine flew in 1951 and is now at the Naval Air Test Center at Patuxent River, Md., where, had a ship been available, it would by now have completed carrier trials. The recent speed-record attempts were made by the second prototype which, although still fitted with a Westinghouse J40, has the production-type afterburner, which probably raises the sea-level thrust to well over 10,000 lb. As we recorded last week (*Aircraft Intelligence* page) the J40 programme has been eliminated and the Skyray may perhaps see service with an engine of Pratt and Whitney or Rolls-Royce origin.

Another El Segundo design is the A2D Skyshark turboprop strike aircraft developed from the Skyraider. Procurement has been reduced to a small test quantity and it now appears that the perennial Skyraider will lead straight into a turbojet replacement—the latter having been named in some quarters as the supersonic A4D Sapphire-powered design, otherwise known as "Heinemann's hot-rod." But less secret is the mighty A3D, and a fine design it is.

Rather larger than the Canberra, and nearly twice as heavy, the A3D—as yet unnamed—is a strike/bomber designed for use on the forthcoming *Forrestal*-class carriers. In contrast to the Skyray, the A3D employs a high-aspect-ratio wing; its designer, however, said that there was not much to choose between the two and the aircraft might easily have appeared with their wing-types interchanged. The wing of the A3D is fully slotted and flapped for reducing take-off and landing speeds when carrier based. The power units are two powerful turbojets podded well under the mid-high wing; at present J40s are used, but Rolls-Royce or Pratt and Whitney will probably provide the production engine.

The principal duties of the aircraft will be low- and high-level bombing and reconnaissance, at considerable ranges from the carrier. Steam catapults will assist in getting the machine airborne, but landings should be possible without any special devices. The maximum lift coefficient is very high and Douglas are proud of their full-span slats on this very thin wing. Both the wing and vertical tail surfaces fold hydraulically.

Like most American high-performance types, the A3D uses all-hydraulic auxiliary power, except for an electric tail-trimming jack. The various pumps and generators are all mounted on one big gearbox in the fuselage driven by an air turbine supplied by compressor-bleed air. In addition to the usual advantages of this arrangement, the A3D turbine and gearbox is accessible from the crew compartment, so that the various valves and switches can be operated manually.

The first A3D is still being tested at Edwards A.F.B.; production at El Segundo will shortly begin. The U.S.A.F. variant of the A3D (the B-66 in several forms) will be built at Long Beach, another of the three big Los Angeles Douglas plants. The third, and original, factory is that of Santa Monica, whence have come so many airliners. Douglas feel quite happy to wait before freezing a new airliner design. At the moment, whatever others may say, Douglas have no fixed plans in this field and are, in any case, full with orders for all types of Turbo-Compound and turboprop transports, including one Globemaster-development to be powered by Pratt and Whitney split-compressor turboprops and to have a 100,000 lb payload. But it can be said that the next Douglas civil family will probably have turbojets, and will have a fuselage about as big as that of the DC-7.

As for the omnipresent "DC-3 replacement" question, Mr. Heinemann was non-committal. So far as America is concerned, DC-3 operators are now generally using DC-6s and he felt that there was sufficient traffic to support purchase of bigger aircraft.

PILOTS FOR THE AIRLINES *(concluded from opposite page)*

Some time during this first year the cadet will have obtained his Commercial Pilot's Licence and, if he is going to be engaged on long-distance aircraft, his Flight Navigator's Licence. It will be borne in mind, of course, that most of the technical work for both of these licences will have been done during his two years at the school. In spite of this, the airlines will be liable to some financial expenditure, especially where specialized flying training is required. Nevertheless, as I mentioned before, the airlines must expect to pay something towards the overall scheme and the pupil is making his contribution by having to keep himself for a year without salary. If he were required to fly abroad, the cadet would, of course, be entitled to the same allowances as the operating crew.

At the end of three years, then, we have a man who is already employable; and whilst his experience is limited he can still be profitably engaged on the easier routes. His general flying experience will have provided a strong background for his subsequent flying and in this connection it can be noted that the past has shown that the practised navigator who has hitherto spent his flying hours in the back seat finds it comparatively easy to make the change into a co-pilot's shoes merely because he has the right sort of background.

Our cadet will now, of course, be eligible for a salary at the agreed scales and it will be the airline's responsibility—and also in its interest—to see that he is brought on progressively to command status. Under normal conditions it can be assumed that this would take place in his late twenties, and that by the time he was 36 or 37 he would be in a position to receive promotion to Senior Captain, First Class. Thus his pension rights would be assured in the correct amounts and he could look forward to a progressively remunerative career.

This, then, is my solution to the problem of where the next generation of airline pilots is to come from. It is an extremely flexible scheme in which the financial load is spread amongst all the interested parties. It still leaves a great deal to the would-be pilot in the matter of hard work and its accomplishments; at the same time, it ensures that he will get the maximum assistance where it is needed. If it should seem to some a little unorthodox, I can only reiterate that there are really no precedents in the matter and that my scheme has just as much chance of turning out good airline pilots as one in which the cadet is kept in school until he has gone through a long and expensive training and obtained all his licences on various types of aircraft. Above all, it probably has a much better chance of appealing to the authorities who will have to make the final policy decision on the matter; and that in itself is not without some importance.

HELICOPTERS AFLOAT

The Helicopter Association Hears Lectures on Shipborne Operations

AS briefly recorded in last week's issue, the second meeting of the Helicopter Association's 1953-54 session took place on October 3rd in the library of the Royal Aeronautical Society. Two papers were read, "Shipborne Helicopter Operations," by Lt-Cdr. H. R. Spedding, M.B.E., and "Helicopters and the Whaling Industry," by Mr. A. E. Bristow, A.R.Ae.S. A summary of the papers, and notes on the discussions, are given here.

THE chairman of the meeting, W/C. R. A. C. Brie, introduced the first lecturer. Lt-Cdr. Spedding, he said, was the commanding officer of No. 705 Helicopter Squadron, R.N.A.S. Gosport. He had been flying with the Fleet Air Arm since 1940 and had converted to helicopters in 1952. Of his total of 2,000 flying hours, 500 had been on helicopters. He had been appointed M.B.E. for his work in connection with the flood rescues in Holland, and had had the honour of being pilot to H.R.H. the Duke of Edinburgh when His Royal Highness flew from Buckingham Palace in a helicopter.

Lt-Cdr. Spedding prefaced his remarks by giving a brief history of the helicopter operations in the Royal Navy. No. 705 Squadron was formed in 1947 out of a post-war helicopter flight at R.N.A.S. Gosport, operating Sikorsky R-4 machines. In 1950, the squadron was re-equipped with W.S.51s (Dragonflies) and its tasks of pilot training, communication, photographic and radar calibration duties were increased to include air/sea rescue work. Now crews were trained in the technique, and at the present time each aircraft carrier in commission was equipped with two Dragonflies, as were the major Naval air stations. In November, 1952, the first Royal Naval operational helicopter squadron was formed at Gosport and by February, 1953, it had started anti-bandit operations in Malaya.

Before the introduction of the helicopter in its rescue capacity, he continued, an aircraft carrier had to have a destroyer in attendance whenever aircraft were being flown-off or landed-on. The destroyer followed some two or three hundred yards astern with its sea boat ready for lowering. Not only did the helicopter, with its crew of two, replace the destroyer, but it could carry out any required rescue more quickly and efficiently. The destroyer was thus released to carry out its normal screening duties, an important factor in time of war.

When employed on plane guard duty, as this work was termed, the helicopter took up a position off the starboard side of the carrier, level with the "island," a few minutes before the fixed-wing aircraft were due to take off. This position was maintained until all the aircraft had left the vicinity of the carrier, after which the helicopter landed back aboard. When aircraft were due to return to the carrier the helicopter took station between 50 and 100 yards off the starboard quarter, from which point it could rapidly pick up the survivors of a possible ditching without interfering with the approach path. Normally the helicopter lowered a sling: the survivor passed this under his armpits and was then hoisted aboard. If the man was unconscious, the pilot could lower the aircrewman on the winch to secure the survivor to the sling, whereupon both were hoisted up together. There were numerous instances of pilots being back on board the carrier within three minutes of ditching.

When not in use the helicopter was secured in the aircraft hangar with rotor-blades folded. The machine was placed on the elevator, which was then raised to approximately six feet below the flight-deck level. The blades could then be folded or spread by an experienced crew in about four minutes. This operation, and also that of starting and stopping the rotors, proved to be difficult and somewhat hazardous when wind speeds exceeded 25 kt, but the actual take-off and landing were not so difficult provided reasonable care was exercised. It was found that the best practice was for the helicopter to take off before the carrier turned into wind or built up speed to launch its fixed-wing aircraft. This avoided subjecting the rotor to unnecessarily high wind-speeds over the flight deck.

For landing the approach was made fairly steeply to a point between 10 and 15 ft above the deck. Height was then reduced to 5 ft while hovering, and the ground cushion tended to make the helicopter move up and down in sympathy with any rise and fall of the deck. From this position a steady rate of descent was maintained until the wheels made contact. The collective-pitch lever was then lowered and held in the fully down position.

Although the carrier helicopter's primary function was rescue, Lt-Cdr. Spedding went on, it had also performed a number of extremely useful general-purpose duties, including gunnery and torpedo spotting, and communications between ships. In the latter rôle, mails, equipment and personnel could be rapidly and easily transferred from one ship to another, there being no necessity for the ships themselves to change station.

Apart from the carrier operations, actual helicopter landings had been made on H.M.S. *Vanguard* and, early in 1951, a Royal Fleet Auxiliary vessel was fitted with a steel landing platform over the stern. The platform measured 59 ft fore and aft by 50 ft beam. At the forward end were three 12 ft high screens which could be raised or lowered as required to give wind protection. A number of sunken eye-bolts and cleats were fitted to enable the machine to be satisfactorily secured in rough weather conditions and the surface of the deck was painted with a special non-skid paint.

In all, a total of 183 deck landings were made in these experiments, of which 27 were carried out while the ship was in harbour. The maximum ship movement observed during the sea landings was 10-14 ft vertical, and 10 ft lateral through roll. The maximum wind speed recorded was 38 kt.

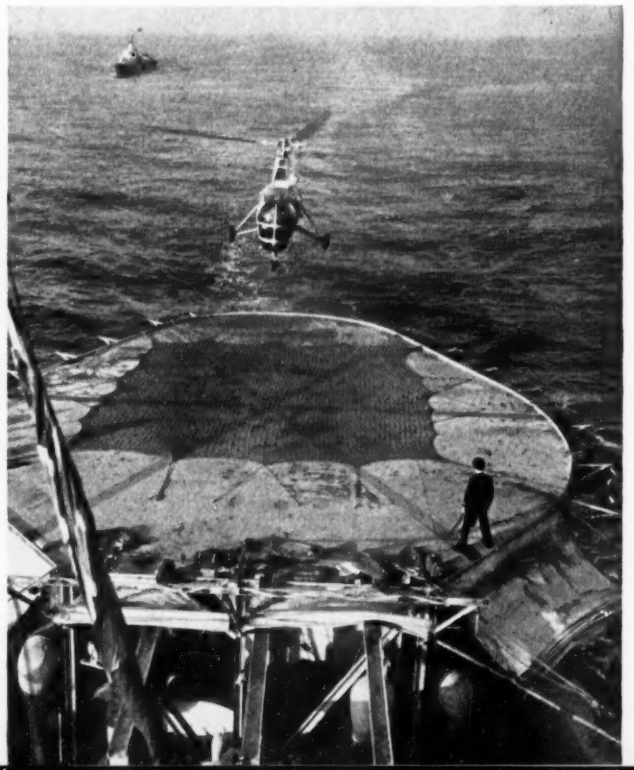
As a result of these trials there were several features which should be embodied in a helicopter for shipborne use, to enable it to be able to operate in all but the worst of sea conditions. The c. of g. should be as low as possible to reduce the tendency to turn over on a rolling deck; the skid-type, or a four-wheeled, undercarriage of wide track was preferable to the three-wheel undercarriage; the deck itself should be fitted with a turntable, thereby allowing the helicopter to be manoeuvred into the relative wind without any alteration of course by the ship; and an improved method should be devised to secure the helicopter to the deck immediately the landing had been completed.

So far as helicopter operation from small ships was concerned the survey vessels of the Royal Navy offered the greatest possibilities. The helicopters would be of enormous value to such a vessel, said the lecturer in conclusion, to assist in all forms of reconnaissance, and their further development would increase considerably their usefulness and efficiency.

HELICOPTERS AND WHALING

THE second paper was then read by Mr. A. E. Bristow, who was chief pilot in the Antarctic whaling expeditions of 1950-52, who had previously had considerable Naval and (with Westland Aircraft) test-flying experience with helicopters.

The lecturer showed an interesting film of whale operations in the Antarctic and said that he first used a helicopter on a whaling expedition during the 1950-51 season. The machine was a Hiller



A Naval Dragonfly approaching to alight on the stern deck of H.M.S. "Fort Duquesne" during sea-going trials. The grass-rope net was used to assist in securing the aircraft to the deck immediately on touch-down an essential operation if a high wind was blowing.

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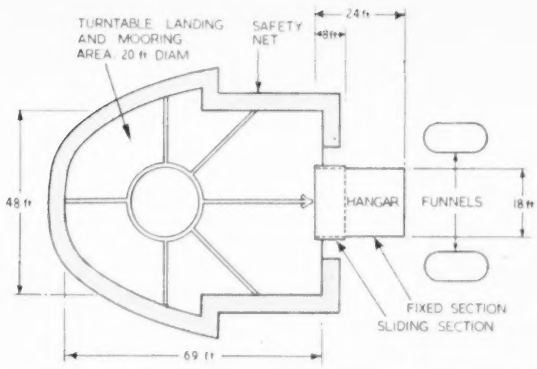

Dimensions of the turntable flight deck fitted over the stern of a whale-factory ship. Wind-breaks were found unnecessary.

HELICOPTERS AFLOAT . . .

360. An expedition consisted of a factory ship with 12 to 14 attendant "catcher" craft. Of this catcher fleet perhaps three or four were used throughout the season as tow-boats and/or for long-range reconnaissance. The catchers, having hunted and killed a whale, inflated it with compressed air and marked it with the company's flag. The tow-boats steamed all over the hunting area collecting the flagged whales and towing them back to the factory ship for processing. Most modern catchers were equipped with comprehensive radio aids and were manned by a crew of 18 to 20 men.

Command of a whaling expedition was usually vested in the master or manager of the factory ship, who decided where the fleet should hunt for whales and also controlled its tactical disposition. It was common practice for catchers to hunt in an arc four points on either side of the general direction of movement of the factory ship at a distance of 50 to 120 nautical miles ahead.

The sea between the nearest catcher and the factory ship had, then, to be considered as a thoroughly searched area and the helicopter patrol had to extend at least 50 nautical miles beyond the furthermost catcher to derive the greatest benefit from aerial reconnaissance. This requirement dictated that an endurance of at least nine hours was necessary and that, ideally, more than one helicopter should accompany each expedition.

The uses for helicopters in Antarctic whaling could be summarized as follows: (1) Search for whales; (2) direction of catchers on to targets; (3) search for flagged whales; (4) ice reconnaissance; (5) transfer of sick or injured men from the catchers to the factory ship for treatment. The lecturer thought that in the future, when larger helicopters were available, they would be also able to take over some of the catchers' duties in actually doing the killing, inflating and flagging from the air.

The use of fixed-wing aircraft on expeditions prior to 1950 had not met with any marked success, due mainly to the bad weather conditions prevailing. A further drawback was that the fixed-wing floatplanes could not operate when the factory ship was engaged with a catcher or supply ship alongside, or when there was pack-ice in the vicinity. With the helicopter flying from a turntable on the factory ship's deck this objection did not apply. Deck handling of the machine had not presented many difficulties, except that care had to be taken to land squarely back on the turntable to avoid the risk of puncturing one of the "doughnut"-type pontoons fitted. Windscreens had been fitted on deck but they were never used, although high relative winds were experienced. The maximum recorded wind speed was 52 kt.

The helicopter could carry out reconnaissance duties in the whale search much more efficiently than could the catcher vessel. During the previous season, 1,334 whales had been sighted from one S.51 helicopter in 185 flying hours. A future reconnaissance helicopter with a safe endurance of nine hours, flying at 300 to 500 ft, could cover a sea area of 13,500 square miles in the course of one flight, whereas the catcher vessel, with a visibility of 7½ miles from the crow's nest would take 20 hours to cover only 4,500 square miles. The use of helicopters for spotting also improved considerably the proportion of whale killings to sightings.

The lecturer then digressed to give some of his experiences of ice accretion on the rotor blades. Icing conditions had been encountered on several occasions and with varying degrees of severity. In the first stages of ice formation on the blades there was no appreciable change in power settings or vibration, but if the icing became serious a marked drop in rotor revolutions was apparent, accompanied by some increase in stick vibration. During some hovering tests ice was allowed to build up on the blades until flying became impossible, and immediately prior to landing in this state the vibration became "severe to violent" throughout the whole machine. The tail rotor, however, remained mysteriously immune from ice accretion.

Application of de-icing compound to the rotor blades was found to be extremely difficult and not satisfactory. It was thought that some means of preventing large-scale accretion was essential to helicopters employed in such weather conditions.

In conclusion, Mr. Bristow outlined future possibilities for the extended use of helicopters in the whaling industry. A large machine carrying a harpoon gun and inflation equipment could take over entirely the catching vessels' duties. He thought that in an expedition more than half the catcher vessels could be replaced by six or eight large helicopters operating from the factory ship, with only a few tow-boats to bring the whales back to the factory ship for processing. This would reduce the cost of the expedition and cheapen oil production.

THE DISCUSSION

W/C. BRIE (the chairman) wondered whether a wheeled undercarriage was necessary for shipborne use. He referred to a system of anchorage used experimentally on the M.V. *Dagestan* during the war but never fully developed, and also mentioned the first shipborne Autogiro landings, by Lt. Pride on the U.S. Carrier *Langley* in 1931 and by himself on the Italian cruiser *Fiume* in 1935.

MR. J. S. SHAPIRO (consultant) thought that the naval pilots had done a good job with equipment which was only just adequate. He would

The helicopter pilot's view of the factory ship, with a catch of whales alongside awaiting processing. When the whales are killed, compressed air is injected to keep them afloat.

A small flight-deck—usable only in fair weather—fitted to one of the "catcher" vessels which operate from the whale-factory ship.

HELICOPTERS AFLOAT . . .

have liked to have seen a twin-engined helicopter designed specifically for naval use, capable of single-engine hovering.

CDR. G. B. HODGKINSON (Bristol) asked whether it was advisable that the helicopter pilot should sit in the right-hand seat because, on plane guard duty, this position was on the opposite side of the machine to that on which the fixed-wing aircraft were approaching and landing.

MR. KENNETH REED (Saunders-Roe) had found some conflicting opinions between the two lecturers as to whether the rotors should be started tail to wind or head to wind in gusty conditions. He personally preferred to have the wind on the beam. He said that Mr. Bristow had quoted a much higher wind speed for safe operations, and he wondered which was accurate.

CDR. (E) R. H. WEBBER (R.N.A.S. Gosport) was not sure that a twin-engined configuration would be suitable for naval helicopters but thought that the Double Mamba might have possiblities.

MR. ALAN GREEN (Silver City), in a written contribution, said that he had completed a full season's flying with a Hiller helicopter on a whaling expedition without experiencing the severity of ice accretion mentioned by Mr. Bristow, although some extremely bad weather conditions had been encountered.

MR. COLIN COOPER asked whether the Navy had yet had experience of operating their small two-bladed helicopters in a high wind at sea. He said that Canadian ice-breaking vessels had standardized on this type for Arctic work and thought they were more manageable.

MR. "SOX" HOSEGOOD (Bristol) expressed a somewhat jocular concern that, if the helicopter was such an efficient instrument on a whaling expedition, too large a number of whales would be killed and thus seriously deplete the whale stock.

MR. BASIL ARKELL (helicopter correspondent) described a device to secure a helicopter to the deck immediately on landing which he had helped to develop in the U.S.A. in 1944. Although the experiment had not then reached a successful conclusion it had shown some promise of success and he suggested that Lt-Cdr. Spedding's unit might well continue research to make it a practical proposition.

LT-CDR. SPEDDING, in conclusion, reiterated his opinion that the four-wheeled undercarriage was better than the tricycle, but that they had had no actual sea experience as yet of the skid-type. He said that the reason why the pilot of an S.55 sat on the starboard side was that the rescue winch and access door were fitted on that side. The wind-speeds he had quoted in his lecture were for guidance only, and successful operations had been carried out with windspeeds of 45 kt and over.

MR. A. E. BRISTOW requested that he might be given more time to consider his answers to some of the questions posed, and the chairman thereupon closed the meeting.

Small helicopters, such as the Hiller 360 seen here in a protective cover, are successfully used for whale-spotting duties.

FIRST OVER ENGLAND

The Curious Story of Vincent Lunardi and his Pioneer Balloon Ascent of 169 Years Ago

ONE HUNDRED and sixty-nine years and one month ago—on September 15th, 1784—"the most fascinating young man in London" risked his life before an audience of 150,000 people including the Prince of Wales, afterwards George IV.

The King himself cancelled a Cabinet meeting to watch the affair through a telescope from the balcony of Buckingham Palace. Even the course of justice was suspended. The Law Courts were closed and at the Old Bailey a prisoner, charged with murder, was hastily acquitted, so that the jury and Court officials could watch the spectacle.

London took its cue from the King who had said: "Our business we may see to on the following day. But we may never see poor Lunardi again."

So thought most of the spectators. But Vincent Lunardi, secretary to the Neapolitan Ambassador in London, was supremely confident. For years this handsome young Italian had been obsessed with the desire to be the first man to fly over England.

In collaboration with his friend, Dr. James Fordyce of Edinburgh, Lunardi had found a successful method of filling a balloon with hydrogen. Ten months earlier two Frenchmen had made an ascent but they had used "a dangerous technique which involved heating the air in the bag with a fire."

Lunardi, a superb showman, first set London by the ears when he issued large flamboyantly printed posters which attracted curious crowds.

"I take the liberty," the posters read, "to acquaint the public that I have undertaken the construction of a Globe of 32 feet diameter, with which I intend to ascend as soon as completed, to make the most interesting experiments. Being already involved in great expenses attending the construction of the Globe (so large and made of the best oiled silk), the filling it with inflammable air, the machinery for the experiments, I am obliged to solicit the assistance of the liberal promoters of ingenuity in an undertaking of so curious a nature. The gallery, oars and wings are already made and are to be seen at the Lyceum, Exeter Street, Strand, where the balloon is now constructing and will be finished in about a fortnight."

Permission was granted by the Governor of Chelsea Hospital for the ascent to be made from the Hospital grounds.

Meantime a subscription list was opened. Guinea subscribers to the fund were offered admittance and could "have a chair near the globe the day of ascending" and could "view the construction at the Lyceum four different times."

In keeping with the investor's colourful personality, the balloon was composed of broad alternate stripes of blue and red oiled silk.

Suddenly, in the midst of these preparations, a Frenchman named Moret appeared and announced his intention of making a balloon flight on a date prior to that fixed for Lunardi's attempt. However, unhappily for Moret, the balloon caught fire on the ground when the bag was being heated. So great was the anger and disappointment of the crowd that the Frenchman was lucky to escape being lynched. In the light of this accident the Governor of Chelsea Hospital revoked the permission given to Lunardi to make his ascent from the Hospital grounds.

Despite this set-back the irrepressible Italian persevered until eventually he obtained permission to use the drill ground of the Honourable Artillery Company in Moorfields.

When the appointed day came, crowds flocked to Moorfields from early morn. Just before two o'clock Lunardi and a Mr. Biggin, who was to travel in the balloon as an observer, made their final preparations.

At the last moment it was decided that the combined weight of two men might stop the balloon from rising. Accordingly Mr. Biggin gave up his seat in favour of a dog, a cat and a pigeon.

On the firing of a gun, Lunardi cast off at precisely five minutes past two, and the balloon, amidst great acclamation and applause from the spectators, rose into the air. Up it soared with the inventor working furiously at the vertical oars which were meant to control the balloon's height.

Unfortunately one oar became detached and fell to the ground. A woman who mistook the oar for the aeronaut was so affected by shock that she died shortly afterwards.

On and on floated the balloon and its occupants, slowly passing from the view of the excited crowd. At this point Lunardi, according to the journal which he kept, "uncorked a bottle of wine, drank, ate, and wrote just as if in my study."

At half-past three the balloon came down near South Mimms. Here Lunardi landed the cat, which was feeling cold, and promptly took off again.

He finally touched down at Standon, near Ware in Hertfordshire, assisted by a young woman who, mustering a few labourers, prevented the undercarriage from being dashed to pieces on the rough ground and hedges. A memorial stone now marks the landing place.

The success of the flight sent Londoners delirious with excitement. Fêted and lionised wherever he went, Lunardi exhibited his balloon at the Pantheon in Oxford Street. He was received by the King; a medal was struck in his honour and a public fund opened for his benefit.

Lunardi made several flights later, mainly in Scotland, covering over 100 miles on one ascent.

Twelve years later he died—poverty stricken—in a monastery in Portugal.

C. A. McC.

FAIREY GANNET

ANTI-SUBMARINE SUPER PRIORITY

..."Anti-submarine weapons, both shipborne and airborne, far more effective than anything known during the last war, are becoming available, and arrangements have been made to enable heavier and faster types of naval aircraft to be handled in, and operated from, our fleet carriers."

Extract from the Statement by the First Lord of the Admiralty explanatory of the NAVY ESTIMATES, 1953/54.

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The background design shows a few of the 181 types that have been fitted with de Havilland Propellers in the past 18 years

A formation of Saab J.29s overhauls the photographic Lancaster at more than double the latter's speed, while another machine (below) breaks away towards the clouds below. The relative proportions of ailerons and flaps are clearly shown

Swedish Fighters in Cambridgeshire

More about the Saab J.29s' Visit to Waterbeach: Some Performance Estimates

Illustrated with "Flight" photographs

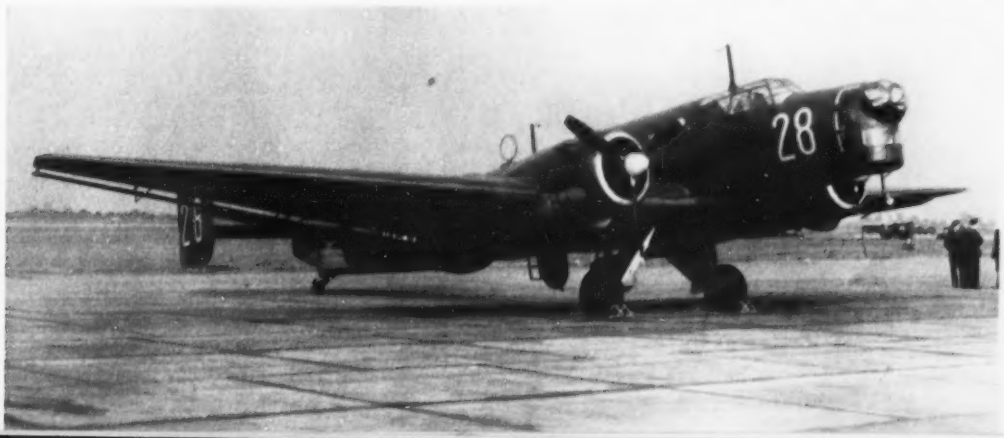
THE visit to England of the nine Saab J.29s (whose arrival we described last week) ended on October 8th with their return to their home base in Sweden. During their stay personnel of the squadron were the guests of the R.A.F. at Waterbeach, and both the timetable of their visit and the facilities accorded to them were most efficiently organized. Parties of officers and other ranks were conducted round London to see the sights, to be received by the Lord Mayor, to visit the theatres or shows of their choice and to make the rounds of the London shopping centres.

Tuesday, October 6th, was, however, spent at Waterbeach and an opportunity was provided for Swedish, British and American pilots to get together and show their various aircraft to one another and to demonstrate their ability. The ball was set rolling by a display of massed take-off, formation flying and stream landing by the Waterbeach Meteor wing. The wing "stacked" on the runway and then took off in pairs very closely spaced. They next carried out three fly-pasts, the first in massed formation of "box fours," the second in box fours line-astern and the third in fours-in-echelon line-astern; from this formation they broke and carried out a rapid stream landing in pairs.

This display was followed by the eagerly awaited formation manœuvres by four J.29s. These taxied out at what appeared to be a steady 30 m.p.h., rolling considerably on their narrow undercarriages. They lined up and took off in a single box formation and left the circuit to burn off some of their fuel load. Then, quite suddenly, they returned to make an exceedingly low pass at the airfield in an elongated "finger four" formation. This formation, which resembles a staggered line-astern, they maintained throughout an impressive display. The aircraft appeared to be very quick and responsive to their controls and the turning radius at speed was shown to be very small.

After the J.29s had made their stream landing came—as the

One of the two veteran Ju86s which brought ground crews and equipment for the J.29s. The engines are Bristol Pegasus.

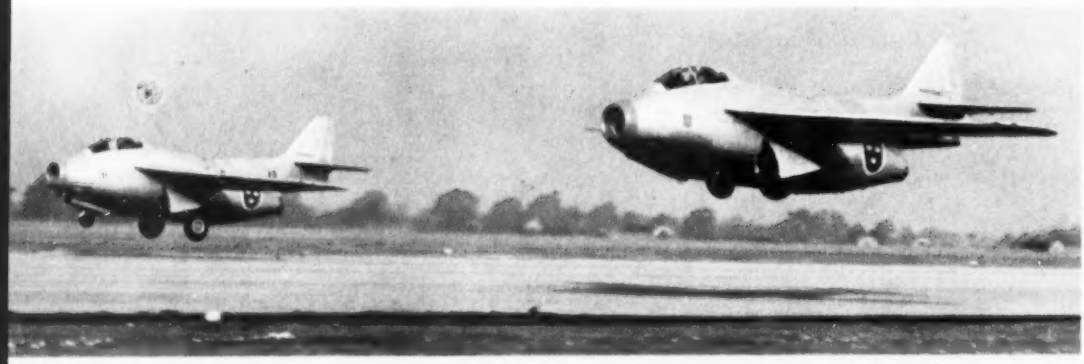


guests themselves would have admitted—the star turn of the day. With four-eights cloud at about 3,000ft making conditions difficult, the Fighter Command team from Duxford gave an impeccable display of formation aerobatics with four Meteors. For smoothness, precision and timing it equalled even the so-far unsurpassed performances of some of the U.S.A.F. Skyblazer teams. Their loops, changing from line-astern to box formation on the way up, took them squarely into cloud on several occasions, but the formation was never relaxed, nor the gracefulness of the manœuvre disturbed. Their last low pass towards the onlookers ended in a spectacular three-dimensional Prince of Wales feathers break, after which they reformed for a low, very slow, tight-formation fly-past.

Following this event attention was focused on the station's own aircraft, Swedish pilots being given experience in the Meteor 7s. Two F-86As dropped in from Bentwaters; and some J.29s took off to pose for the air-to-air photographs with which this article is illustrated. The skies over East Anglia being the happy hunting-ground that they are, it came as no surprise that four J.29s were bounced by four Sabres. The Swedes were, however, caught on the climb without sufficient air-speed for effective manœuvre, and under the swooping vertical attack of the Sabres they were left at a considerable disadvantage. In instances such as these the American policy of climbing at near combat cruising speeds is seen to be fully vindicated. In modern fighter combat, when manœuvre in the vertical (as opposed to the horizontal) plane is common, speed is indispensable, especially in the vulnerable stages during the climb. Once the high-speed fighter is held at constant altitude and forced to reduce its speed it is on equal terms with aircraft of the Meteor type, because these latter, though they may have excellent turning and looping characteristics, are otherwise helpless "on the Mach" at the fast fighters' cruising speed.

But the J.29 is neither quite a low-speed nor high-speed fighter.

Swedish Fighters in Cambridgeshire . . .



In overall performance it can be said to lie somewhere between the Meteor and the Sabre. A general estimate of its performance results in the following conclusions. Firstly its speed and altitude: the limiting Mach number is about 0.86 in level flight at all altitudes, with a variation in individual aircraft in the region of 0.02. Acceleration to this speed is very good and the onset of compressibility troubles is marked by no particularly unpleasant behaviour. Although in a dive this Mach value can be raised to the region of 0.9, Mach unity appears to be out of reach. Trim change with speed is very small and the J.29 is, by all accounts, an excellent gun-platform. The operational ceiling is approximately 45,000ft and the time taken to reach 40,000ft about 10 min., depending on load. The limiting speed with wing tanks is 430 kt. Control, through mechanical elevator, electrically controlled tailplane incidence and irreversible powered ailerons, is well up to modern standards. Rate of roll is very high, turning radius small, while manœuvring in general is assisted by the pilot's Swedish-made G-suits. In fact the J.29 appears to be an excellent machine, despite the limitations in performance by modern standards.

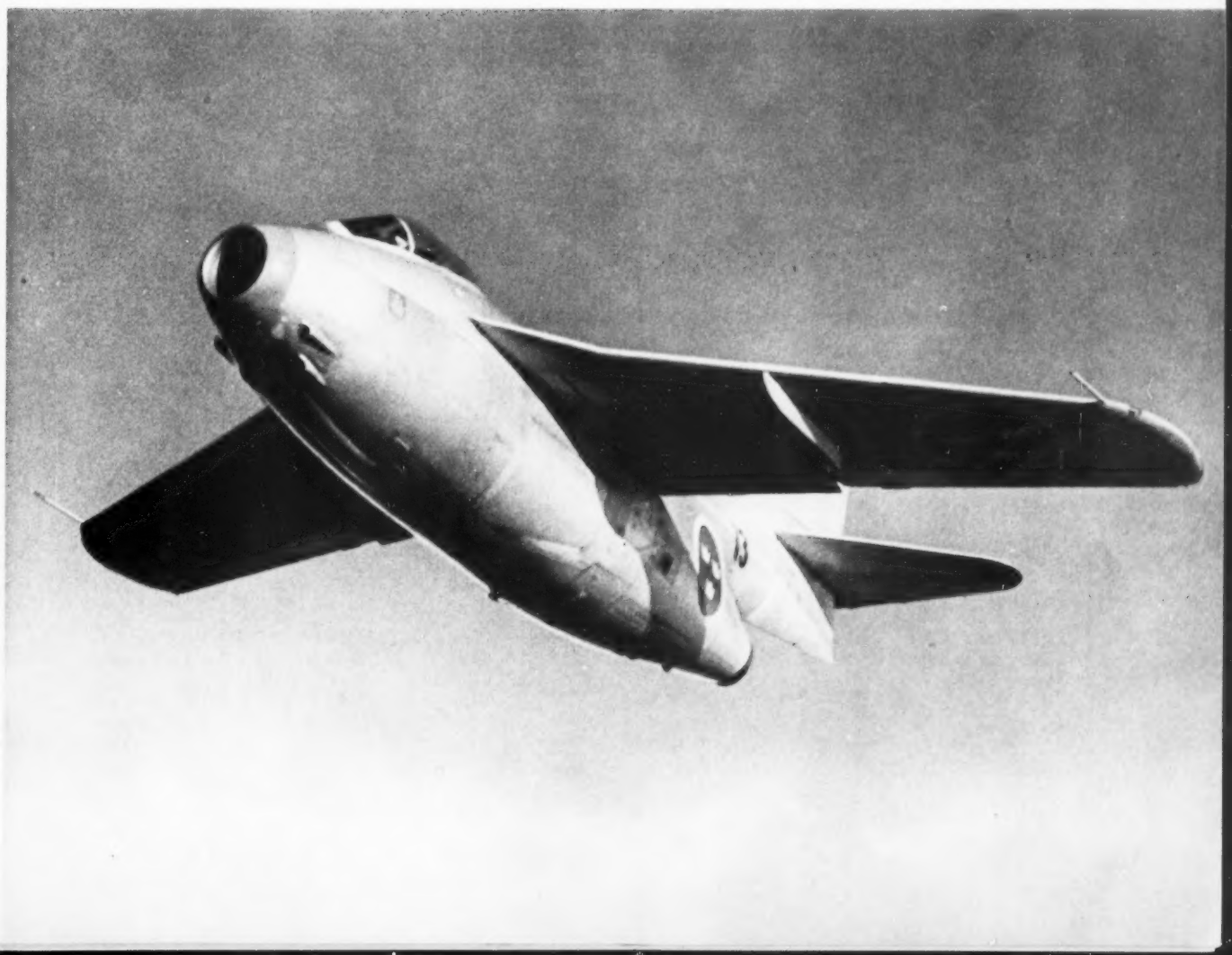
Those of the Swedish pilots who flew the Meteor 7 declared that "with completely unpowered controls and two engines it is, as can only be expected, much heavier to handle than the J.29." A formation take-off in which a J.29 led a Meteor 7 showed that the J.29 accelerated considerably faster both during the ground run and after getting airborne.

One of the remarkable features of the J.29 is the positioning and configuration of the dive-brakes. These are located in the underside of the fuselage, immediately ahead of the mainwheel bay. They are T-shaped in cross-section, the head of the T forming part of the fuselage surface skin, and extend transversely across the airflow. Dive-brakes on the early models of the J.29 were in the wing, but they were found to cause aileron flutter on extension. The ailerons were at that time full-span, with flap action provided by droop. Production models now have small, simple flaps and the ailerons droop slightly as soon as the flap extends beyond the high lift limit. Irreversible aileron control and small anti-snaking strips have eradicated such aileron flutter as may have remained after the dive-brakes were repositioned in the fuselage.

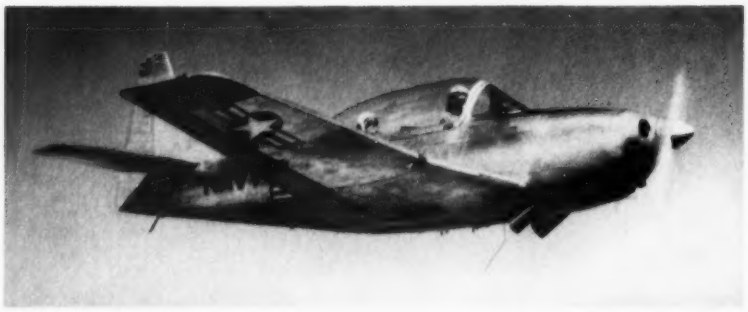
The Swedish pilots showed a lively interest in the aircraft they saw at Waterbeach. In their own country they are not accustomed, as is the R.A.F., to encounters with the Sabre; and the Lancaster from which the photographs in these pages were taken (incidentally, it was one of the "Grand Slam" aircraft used by No. 617 Sqn., still in excellent condition and unmodified) is larger than any of the types operated by the small yet efficient Royal Swedish Air Force.

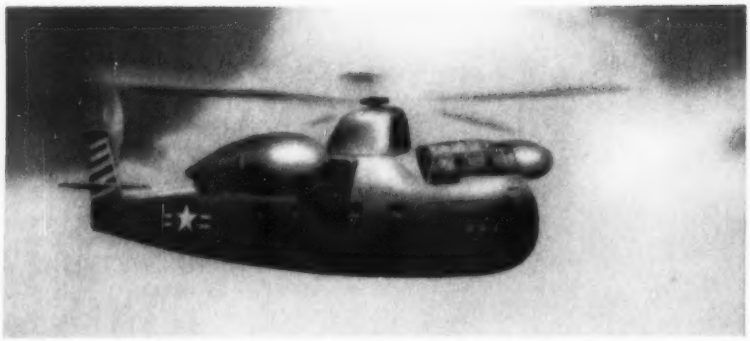
A pair of J.29s takes off from Waterbeach (opposite page) and another, in the remaining views, formates on the photographic Lancaster. At left the fuselage dive brake is seen just closing, forward of the wheel door. The droop of the ailerons when the flaps have been lowered can be seen in the view above.

"Flight" photographs



AIRCRAFT INTELLIGENCE





FOR ENSIGNS AND LEATHERNECKS: The Temco Plebe (top) is a contender for the U.S. Navy trainer competition. Below it is a drawing of the Sikorsky HR2S assault transport of the U.S. Marine Corps. Both types are referred to on this page.

France

Dassault Progress. One of the most important manufacturers in the French industry, Marcel Dassault (Marcel Bloch before 1945) is by no means resting on the laurels of big production contracts for Ouragans and Mystères. (First Ouragan squadrons are now complete.) For the Aéronavale a Mystère 4 development has been prepared, with hydraulically folding wings and a deck hook and catapult spools. This will be a single-seat day fighter, the French Navy having Sea Venoms for all-weather work. Further off is an enlarged Mystère believed to be armed entirely by missiles. This type will be supersonic and may be powered by the Vulcain; it bears the same relation to the Mystère as does the F-100 to the F-86. The most novel project, of which a prototype is under construction, is a delta fighter weighing no more than 4,400 lb. It will be powered by two Viper turbojets, for which Dassault hold a manufacturing licence.

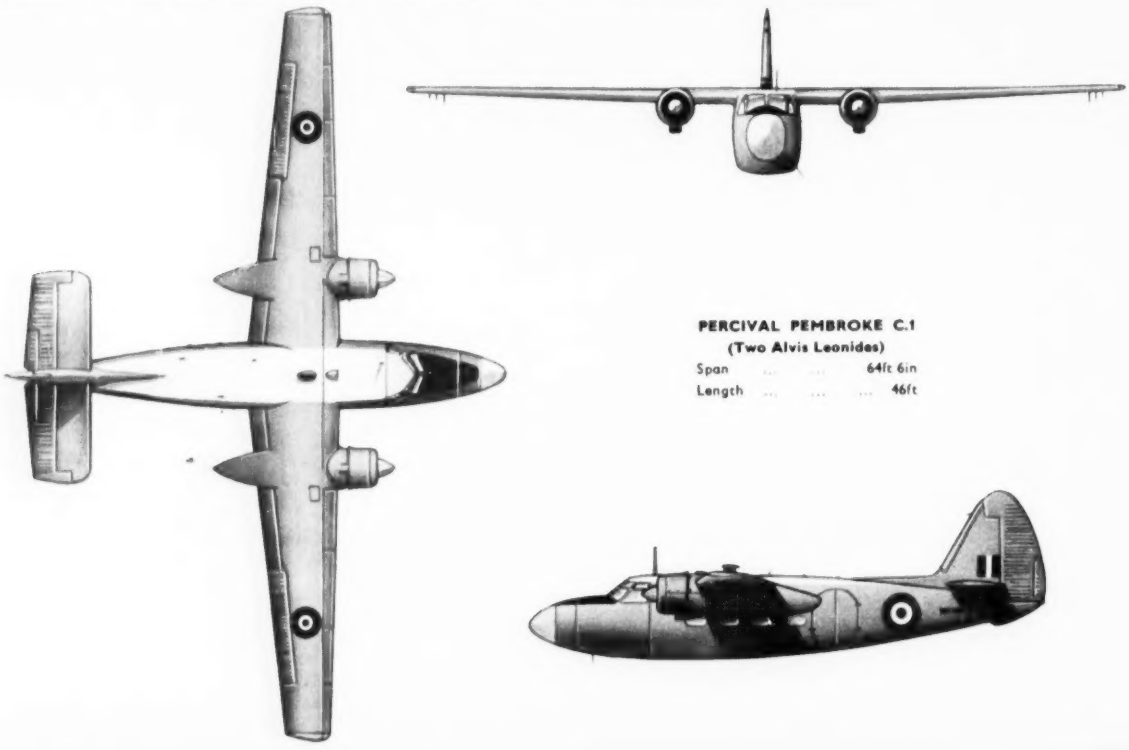
Italy

Rolla Project. The Italian Air Force is sponsoring the construction of a model, to be tested at the Guidonia wind tunnels, which is hoped will support the theories of Sr. Rolla, a civilian engineer. To fly at a modest 3,100 m.p.h., the aircraft has a cigar-shaped fuselage, the top of which acts as a funnel to admit air. This air is then exhausted through a "jet fuse" controlled by a special device, which permits hovering and vertical landings. There is no landing gear, and only an embryonic wing and tail. The design will not, according to Sr. Rolla, crack the sound barrier; instead it will "gradually penetrate into the air, gently and without danger to its structure."

United States

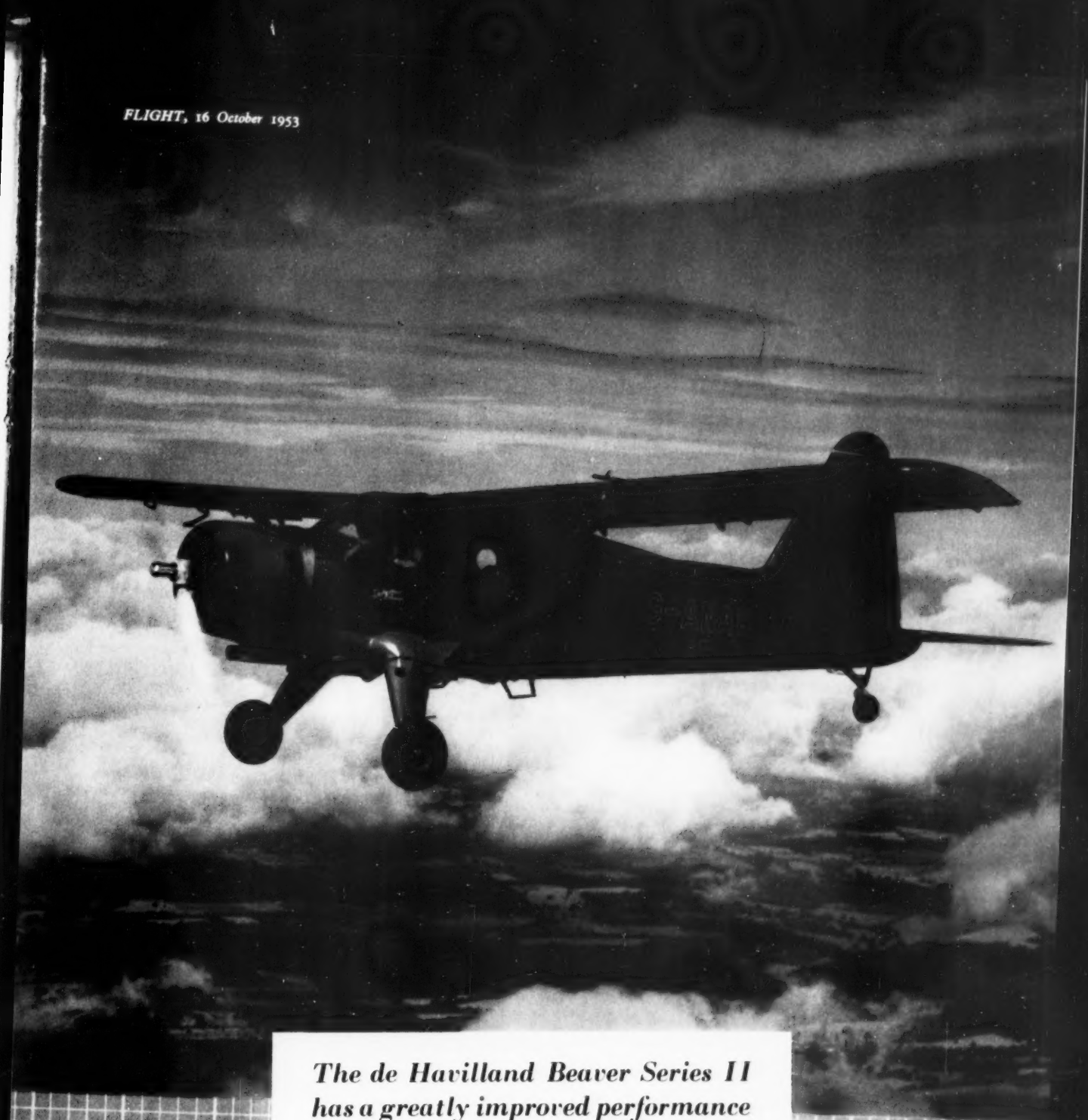
Sikorsky HR2S. Illustrated on this page, the HR2S is the U.S. Marine Corps version of the S-56 helicopter, and is intended as an assault transport. Like its civilian 50-passenger counterpart, it is powered by two 1,800 h.p. Double Wasps. These are mounted in outrigger nacelles into which the main landing gear retracts; the drive is taken through shafts to the single five-bladed rotor, which is designed to function even with one blade shot away. The fuselage has large nose doors and the crew is protected by flak curtains. Cruising speed will be over 150 m.p.h. and a later model with two T56 turbines should be capable of 200 m.p.h. The XHR2S will fly very soon.

Temco Plebe. Illustrated on this page is a new American trainer with this engaging designation. Otherwise known as the Model 33, it was designed and built to a U.S. Navy specification in 75 days. The engine is a 225 h.p. Continental, giving a cruising speed of 171 m.p.h. at 8,000ft and at the full gross weight of 2,500 lb the rate of climb is 1,350 ft/min. We may add, for the edification of those as intrigued as were we ourselves by the name of this machine, that a Plebe is a member of the lowest class of the Military Academy at West Point.



PERCIVAL PEMBROKE C.1
(Two Alvis Leonides)

Span	64ft 6in
Length	46ft



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The PROVOST, side-by-side two-seat Basic Trainer, fitted with the Alvis Leonides engine, is fully equipped for modern all-weather flying, and its performance and handling qualities are perfect for a trainer. Winner of competitive Service trials, the PROVOST is now the standard Basic Trainer in service with the Royal Air Force for whom large numbers are being produced. The PROVOST has also been ordered by the Southern Rhodesian Air Force.

The PRINCE, powered again by "Leonides" engines, is also in service in large numbers with the Royal Navy as a communications aircraft and as a "flying classroom" for radio, radar and navigation training. The PEMBROKE, the R.A.F. version of the PRINCE, ordered in quantity by and now in service with the Royal Air Force, has also been adopted by the Southern Rhodesian Air Force and the Royal Belgian Air Force. The functions of the PEMBROKE include passenger transport in rearward facing seats, freighting, supply dropping by parachute, casualty evacuation, aerial survey and photography and twin engine pilot training. A classroom version for training navigators and bomb aimers has also been developed.

For civil operation the PRINCE serves in many countries throughout the world for executive travel and with internal airlines, carrying 8 to 12 passengers. PRINCES have also been supplied to the British Ministry of Civil Aviation for radar and radio aids, calibration and testing. Its exceptional capacity, comfort and high performance meet the exacting demands of world-wide operating conditions, whilst versatility is exemplified by the SURVEY PRINCE, the only modern British aircraft developed especially for aerial photography, mapping and land survey.

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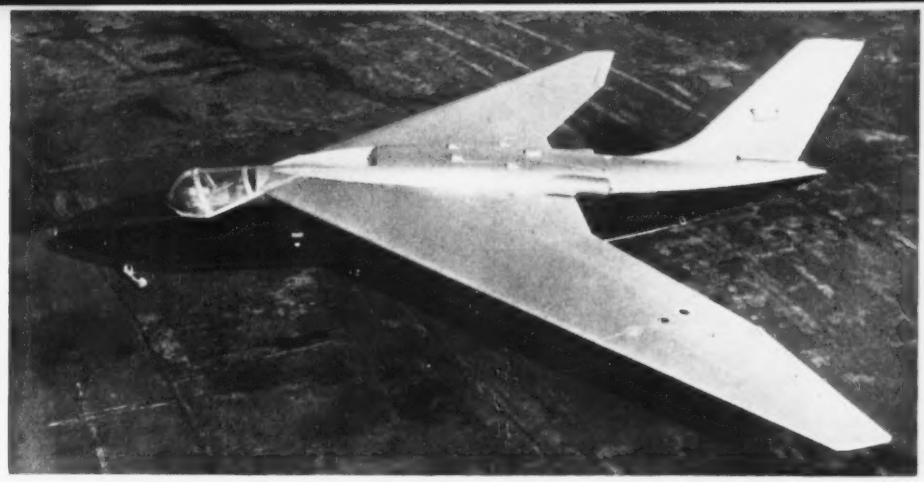


The Short S.B.4 prototype is finished in the same colour scheme as the S.B.5, namely, with a silver wing and a black fuselage. The span is the same as that of a Vampire. Note that there are no horizontal tail surfaces.

SHERPA TAKES THE AIR

Short's Latest Research Aircraft: More About the Aero-isoclinic Wing

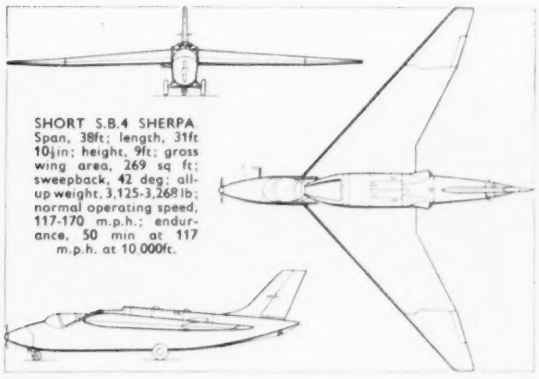
THE prototype Short S.B.4 Sherpa (briefly introduced in our issue of September 11th last) made its first flight on Sunday, October 4th at Sydenham Airport, Belfast. It is the second experimental-wing research aircraft, and the third wholly new design, to have come from Short Brothers and Harland during the past 12 months.

The Sherpa is primarily a research tool to assist in the development of wings for faster, very high-flying aircraft. As Rear-Admiral M. S. Slattery, Short's chairman and managing director, has pointed out, "Sherpas blaze the trail to great heights."

The type of wing which the company have in mind was discussed in our issue of September 11th. No wing—as we then wrote—can provide high-speed efficiency without suffering some penalties at low speeds or in conditions of high-speed manœuvre. Tip-stalling and instability caused by aero-elastic distortion are but two of the troubles frequently met, and the delta and the crescent wing both attack these problems in individual ways. But the ideal theoretical approach calls for the aero-isoclinic wing, which, as its name implies, attempts to maintain constant incidence under flexion, i.e., as the wing bends under aerodynamic loads it always meets the air at the same angle.

The first indication that the company were considering an aero-isoclinic wing was given in a lecture before the British Association a year ago by David Keith-Lucas, R.A., M.I.Mech.E., F.R.Ae.S., the company's chief designer. This lecture, which was summarized in our issue of September 26th, 1952, pointed out the numerous advantages which could theoretically be obtained from a constant-incidence characteristic, but did not indicate whether actual experiments were then in progress. In fact, Shorts were then constructing a simple glider, largely of wooden construction, with the aid of which it was hoped that basic data on aero-isoclinic wings would be obtained. Unfortunately, this aircraft met with a mishap while taking off under tow, and it was decided that trials of a completely new wing of this nature could be efficiently carried out only with a powered aircraft. In particular, it was felt that taking off on tow was asking too much of a test pilot.

Accordingly the aircraft was re-designed to take two Blackburn Turboméca Palas turbojets of 350 lb thrust each, mounted in a fireproof dorsal bay and exhausting above either side of the rear fuselage as shown in the accompanying illustrations. At the same time, the airframe was modified to permit operation at much increased weights; and the S.B.4, as it is now flying, is a fully equipped aircraft which will probably be extremely useful in perfecting these high-flying wings. The whole programme is, we believe, largely inspired by Mr. Keith-Lucas himself. The Sherpa is a private venture and the machine is owned entirely by Short and Harland. There is, however, no doubt that the Ministry of Supply is keenly interested, and it is expected that they will be brought into the picture at some future date.



SHORT S.B.4 SHERPA. Span, 38ft; length, 31ft 10¼in; height, 9ft; gross wing area, 269 sq ft; sweepback, 42 deg; all-up weight, 3,125-3,268 lb; normal operating speed, 117-170 m.p.h.; endurance, 50 min at 117 m.p.h. at 10,000ft.

The most important part of the Sherpa is, of course, the wing and associated control system. The profile is not that of a particularly high-speed wing, for it was felt that the aero-isoclinic principle could be proved just as fully with a more conventional section, so preserving easier low-speed qualities. Sweep-back on the leading edge is just over 42 deg. Construction is largely of spruce with a plywood covering, although light alloy components are used at strategic points. Split flaps are fitted.

The entire wing-tips, with a total area approximately one-fifth of the total wing area, can be rotated either together or in opposition to act as elevators or ailerons respectively. The use of this type of control has been dictated by the flexibility of the wing, which in turn is necessary to preserve constant incidence under flexure. It is, however, expected that the rotary-wing-tip controls will offer unique advantages in the transonic regime and should also increase manœuvrability at high altitudes. The tips are hinged at about 30 per cent chord, and each carries, on its trailing edge, a small anti-balance tab, the fulcrum of which can be moved by means of an electric actuator. The control system is quite normal and appears to work extremely well. The rudder is quite conventional. In its present configuration, the S.B.4 is not intended to test a number of interchangeable wings.

The fuselage is a straightforward stressed-skin structure, with the fuel tankage disposed centrally beneath the carefully-designed air intakes. The Palas is not a suitable engine from which to drive a generator, and the latter accessory is therefore mounted in the nose where it will be driven by a small windmill; this had not been fitted when the accompanying photograph was taken. In the extreme tail is housed an anti-spin parachute, the stream/release mechanism of which consists of a cable running over pulleys in the fuselage to tie-rods which connect with the cockpit control. The undercarriage is fixed.

After the Sherpa's first flight on October 4th the company's chief test pilot, Tom Brooke-Smith, is quoted as saying, "It was, by any standard, a satisfactory first flight. The Sherpa does not appear to suffer from the longitudinal sensitivity normally associated with the tailless configuration. My initial impressions of the stability and control of the aircraft are very favourable." We learn that Mr. Keith-Lucas himself was in the control tower at Sydenham at the time, and that he was extremely impressed by the lovely picture made by the Sherpa as it cruised in the airfield circuit. In the air it reveals unexpected beauty and has been quoted as "one of the most graceful aircraft now flying." It is to be hoped that testing will be rapid and successful so that the company can apply their knowldge to the design of a machine which should be more controllable at a greater height than any other aircraft.

In conclusion, it may be said that the 60-deg-sweep testing of the S.B.5 adjustable wing aircraft is just being concluded. The aircraft will shortly be modified to a 69 deg configuration with the tailplane mounted under the fuselage instead of on top of the vertical tail. The low tailplane is now being made at Belfast and will shortly be shipped to the S.B.5, which is at Boscombe Down.

GROGNARD'S ARMAMENT

Prototypes for Missile Tests: Load-schemes for the S.E.2418 Project

By JAMES HAY STEVENS

THE massive French twin-jet Grognard has had a rather chequered career and certainly deserves more interest than it has actually aroused. I remember seeing a mock-up in the corner of one of the S.N.C.A.S.E. at Toulouse as long ago as the spring of 1947. Three years later Pierre Satre, chief engineer at Toulouse, explained as he drove me round the first prototype, the S.E.2410, that regulations prevented him from "showing me" the aircraft, but he could not stop me looking!

The second prototype, the S.E.2415, came along a year later and the two have done a great deal of flying with many pilots. At first there was some tail-flutter trouble, but after discussions with British engineers at the 1951 *Salon*, the source was traced to over-balance, which was easily cured. Then a Ministry pilot received a false fire-alarm in the air and cut out his electrics, so that he had to make a belly landing. The net result of these delays was that by the time the Grognard had completed its trials, the French Air Ministry had changed its mind about its requirements for a ground-attack fighter.

The two Grognards are now being used for the trials of various types of missile, of which the French, with characteristic ingenuity, have evolved some striking examples. It will be recalled that the Grognard has aerodynamically "pure" swept wings and that the fuselage is very large because it has to house two Nenes, most of the fuel and an armament bay. The 2410 has a sharp sweep of 42 deg and a short nose, while the 2415 has only 35 deg sweep because its longer nose brings the c.g. forward. It is not generally known that the final project, the 2418, was to have combined the sharp sweep with the long nose and the extra thrust of two Tays. This arrangement would have given a higher performance and limiting Mach number, plus roomier pilot accommodation. General characteristics were to have followed those of the earlier models; leading-edge flaps, Lockheed Servodyne control boosters, adjustable tailplane, four-metre tail parachute, etc. The pilot was to have been protected by almost half a ton of armour plate and there was to have been a fixed armament of two 30 mm Hispano-Suiza Type 603 cannons, mounted in the bottom of the fuselage.

The performance and weight data at the end of this article were carefully estimated from actual flight experience with the two prototypes. It is interesting to note that the limiting Mach number rises from 0.883 at sea level to 0.916 at 30,000ft.

S.N.C.A.S.E. S.E.2418 GROGNARD
Two Hispano-Suiza Tay

Dimensions:—	
Span	44ft 10in
Length	59ft 6in
Track	10ft 10in
Wheelbase	17ft 2in
Wing area	498 sq ft
Aspect ratio	4
Weights and Loadings:—	
Equipped weight	24,800-25,000 lb
Fuel	12,170 lb*
Military load	2,810-4,560 lb
Gross weight	40,100-40,700 lb
Performance:—	
Maximum speed at 28,700 lb:	
Sea level	675 m.p.h.
16,500ft	650 m.p.h.
36,000ft	605 m.p.h.
Climb, sea level at 545 m.p.h.:	
At 39,600 lb	5,600 ft/min
At 35,300 lb	6,400 ft/min
At 30,900 lb	7,800 ft/min
Time to 16,400ft at 39,600 lb	3 min 27 sec
Time to 36,000ft at 39,600 lb	11 min
Service ceiling (1,000 ft/min)	38,000ft
Take-off to 50ft still air	2,100 yd
Landing run, still air, 26,400 lb	1,060 yd
Landing run with parachute	775 yd

*Ferry load fuel 14,650 lb with only the cannon ammunition, 560 lb making a gross weight of 40,000 lb.

THE LOAD-SCHEMES

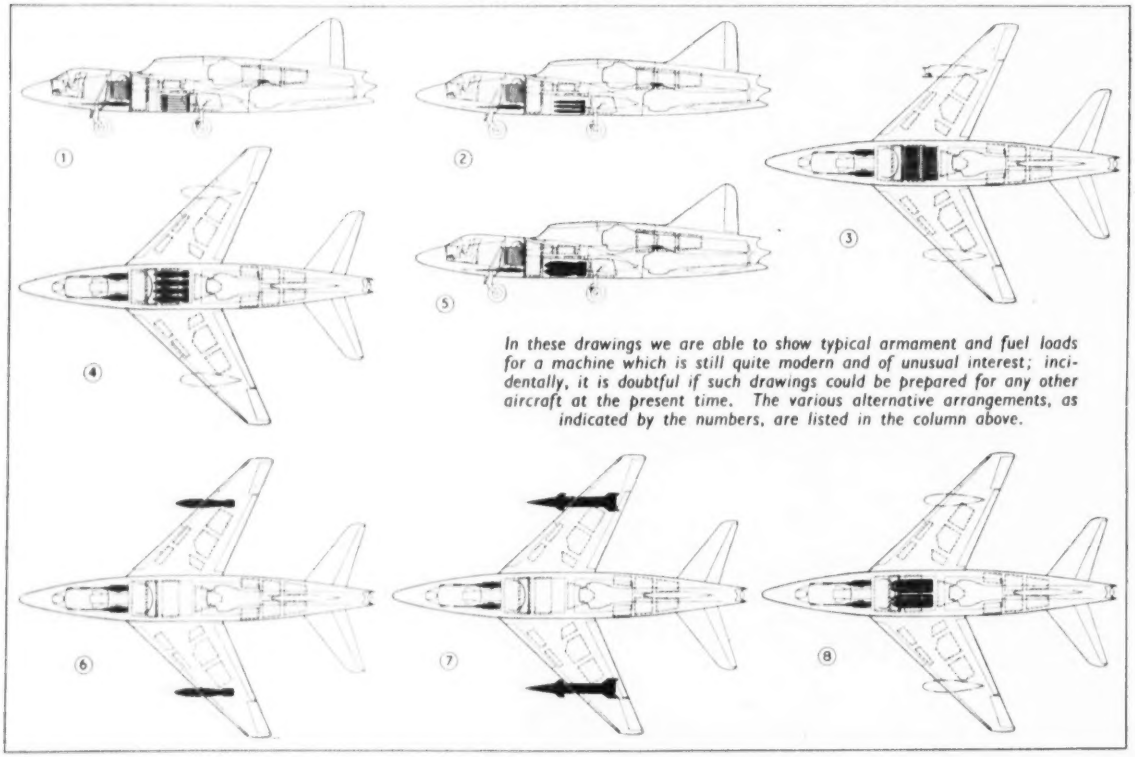
Eight standard loads were envisaged, using the fuselage bay (which is 7ft 6in long, 5ft 2in wide and 3ft 4in deep) and also, despite sweepback, underwing positions for the largest stores. The general schemes for these loads are shown in the drawing below. Details are:—

(1) Full fuselage and internal wing tanks, and the standard 30 mm cannon, each with 200 rounds. The special load was to be 32 × 60 lb rockets.

(2) A similar fuel and cannon load to that of (1) but the load in the fuselage bay was to have been 16 *5-pouces* heavy rockets, weighing over 140 lb each.

(3) The fuel and cannon plus 200 air-to-ground 9 lb anti-personnel rockets. A special launching device for these rockets, developed and flight-tested in the Grognard prototypes, permits

(Continued at foot of opposite page)



In these drawings we are able to show typical armament and fuel loads for a machine which is still quite modern and of unusual interest; incidentally, it is doubtful if such drawings could be prepared for any other aircraft at the present time. The various alternative arrangements, as indicated by the numbers, are listed in the column above.

Space-flight in Perspective

B.I.S. Members Hear a Reasoned Forecast (and Some Costs) by Mr. A. V. Cleaver

MANY over-optimistic and fanciful schemes for the accomplishment of space travel have been put forward during recent years. Such ideas were completely undermined in a paper delivered to the British Interplanetary Society on October 3rd by Mr. A. V. Cleaver, F.R.Ae.S., entitled *A Programme for Achieving Interplanetary Flight*. As the chief engineer responsible for the development of the de Havilland Sprite and Super Sprite, Mr. Cleaver is eminently qualified to tackle this subject from a practical point of view, and he did in fact present a carefully planned and convincing picture of one way in which astronautics might develop.

He divided the development into three phases. Phase 1 was considered as extending to the establishment of unmanned satellite rockets circling the Earth with automatic instruments and telemetering equipment; Phase 2 covered the development of manned satellite rockets and perhaps the first tentative circumnavigation of the Moon; and Phase 3 consisted of true interplanetary flight involving the landing of crews on other planets.

One extreme view of space-flight was that, however feasible it might be technically, it would never be possible economically. Fortunately, no single project during the whole of the undertaking was likely to cost more than £1,000 million. For comparison, Britain had spent over £100m on atomic research since the end of the war, the U.S. was currently laying out £1,000m per year on atomic research, and the present spending-rate on aircraft for the whole world was about £4,000m per year. Thus the immense sums required for interplanetary development were well within the world's resources; but this did not mean that the implementation of a space-flight programme would automatically follow, and sufficiently impelling motives would have to be forthcoming.

Many of the present-day technical achievements would not have come about had it not been for their military importance. An excellent example was the development of the aeroplane—here most of the original research work had been of a purely military nature, and civil applications had followed. Similarly, with the atomic bomb, the £500m required to produce the first bomb would hardly have been found for pure atomic research, or for the problematical production of energy for peaceful purposes.

Mr. Cleaver thought that, although space-ships were unlikely to have much military use, the preliminary work would be carried through by the military authorities. But the later phases would need further justification, and he thought there were at least three practical arguments. Firstly, the challenge of space-flight would offer an alternative to war for man's aggressive, competitive and adventurous impulses. Also, new knowledge—probably of a totally unsuspected nature—would be obtained, and would undoubtedly be put to some commercial use. Lastly, any abandonment of the arms race would result in large-scale unemployment of people with skills and knowledge of little use in normal civilian applications. Many of these people would be in the guided-missile industry, and they could readily be transferred to interplanetary projects as a means of absorbing their abilities.

The lecturer considered that Phase 1 had already started. Much of the information and experience needed to build an instrument-carrying artificial satellite was already being obtained from the guided-missile programme. In particular, the following needed investigation: Phenomena of heat transfer and chemical equilibrium; aerodynamics at Mach numbers from 2 to 20; new high-energy propellants; new heat-resisting steels and ceramics; large rocket motors of up to 100 tons thrust; and new methods of rocket-vehicle construction and control. Most of this work was of interest to the various military agencies and doubtless would get done even if there were no outside bodies with an astronautical interest.

The first unmanned orbital rocket would probably weigh no more than 100 tons at take-off, would consist of three stages and would carry a few hundred pounds of payload. This could be accomplished with present-day propellants, but it was more likely that more energetic combinations would be used. In all probability these first missiles would not be put into stable orbits but would be set at an altitude of less than 200 miles, where air drag would gradually slow them down and return them to earth within a few days or weeks. If the present rate of progress were maintained, this should be accomplished by 1965. The total direct cost for ten such vehicles would be of the order of £50m, assuming that the techniques involved had already been developed, and that the cost of this basic work did not need to be included.

Phase 2 would be the logical extension to man-carrying orbiting vehicles. There were many high-altitude experiments which would need immediate human supervision and which could not be carried out either by remote control or by automatic equipment. No radically new improvements would be involved, and it would simply be a matter of increasing the size of the instrument-carrying satellite. This would still be a difficult enough proposition. A higher orbit would be chosen, probably at about 300 miles, and a vessel for a crew of three might consist of three steps with an all-up weight of 500 tons. For about ten ships the cost might come out at £250m.

Although such vessels would be primarily for research, they might have a minor military rôle for reconnaissance. It had been suggested that a space-station in an orbit would be very useful for military purposes, both as a guided-missile base and as a reconnaissance station. This was nonsense, since such a station would be a gigantic project and would probably not be done for 20 years after the first manned satellites. Since there was never more than five or ten years' difference between the technologies of the major powers, it would be certain that by the time the base had been built any enemy or potential enemy would have missiles capable of shooting it down. It would, in fact, be an exceptionally vulnerable target, since its orbit would be accurately calculable.

Up to this point, it was quite conceivable that the work would continue as a military project, but the military value of a landing (or of a base) on the Moon was difficult to visualize. It was from here on that a purely astronautical body could give guidance or even direct the project, perhaps on an international basis. This body should have been in existence throughout all phases, gathering and correlating information and fostering public and official interest, so that when the time for the final phase came there would be a general willingness to proceed with it. Mr. Cleaver thought the existing International Astronautical Federation could very well carry out this function.

The technical aspects of this phase were considerably more difficult than either of the two earlier phases. Almost certainly a radically new method of propulsion such as a nuclear rocket with a performance two or three times greater than the best possible chemical rocket would be needed to reduce the all-up weight of a Moon-landing vehicle, for two or three men, to less than 1,000 tons. The lecturer thought that with nuclear research proceeding at its present rate a fair guess for the end of Phase 3 would be the year 2000, and the direct cost £1,000m.

GROGNARD'S ARMAMENT (*Continued from opposite page*)

the very rapid delivery of 1,800 r.p.m. It was discovered in the flight trials that the plastic rocket-firing terminals, which weigh only an ounce or two, caused considerable dents in the heavy-gauge leading-edge skin of the low-placed tail plane. It was realized that jettisoning even such small parts at high speeds could be dangerous, and a new type of rubber terminal had to be developed.

(4) Four 250 kg (550 lb) bombs in the fuselage bay as well as the 400 rounds of 30 mm ammunition and the internal fuel.

(5) Three 750 lb bombs in the fuselage cell, still with full cannon ammunition and fuel.

(6) One 1,000 lb bomb under each wing, with standard fuel and ammunition. An extra tank could be stowed in the fuselage bay as an overload.

(7) A Matra air-to-air guided missile (1,764 lb) under each wing in addition to the full cannon armament, and fuel reduced by 880 lb.

(8) Four 350 kg (770 lb) Napalm bombs in the fuselage bay, with the usual cannon ammunition and the reduced fuel load of (7).

(9) The strategic-ferry condition, with the cannon ammunition reduced to 125 rounds per gun. A 1,290 litre (284 gal) tank was to be carried in the fuselage bay. The total fuel load of 8,185 litres (1,800 gal) was calculated to give a range of about 1,500 miles at 36,000 ft.

Firm's drawings of the SE-2418 show under-wing drop tanks on the external-stores mountings, but no mention is made of their use in the loading sheets for any of the schemes.

RADAR SOUNDING

—of the Upper Air: New Developments in the Design of Balloon-borne Reflectors

THIS article traces progress in the collection of upper-air meteorological data by means of balloons, from early visual-tracking methods to the present-day radar technique. It includes descriptions of new types of radar targets used in such work, and with the development of which the author has been associated.

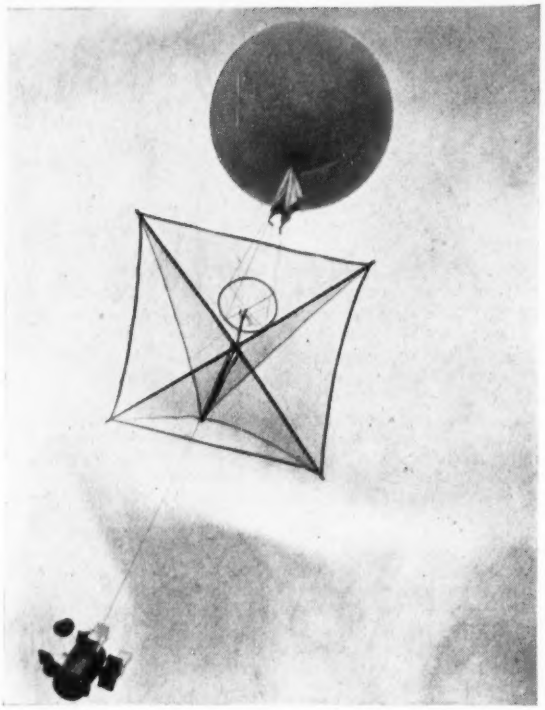
IT is well known that operational requirements of jet airliners call for accurate meteorological forecasts of conditions at various heights on the routes, and that in order to obtain such forecasts it is necessary to provide a three-dimensional synoptic picture of the atmosphere to complement the available ground charts. A network of sounding stations has been set up covering all the major airline routes throughout the world, and information obtained by these stations is centralized and used to plot contour charts of definite pressure-values at given periods of the day. From the charts thus produced it is then possible to derive line forecasts giving the weather conditions likely to be experienced by aircraft following any particular route.

For plotting these upper-air charts and for forecasting the drift of air masses, we must first measure the pressure, temperature, humidity and wind velocity at particular heights, at known times, and at places spaced as uniformly as possible throughout the area to be covered by the charts. This information could be obtained by meteorological-aircraft flights, but to do so on an extensive scale would be a costly procedure. Instead, therefore, use is made of suitable measuring equipment carried by free balloons which rise to heights of between 60,000 and 100,000ft, and which are carried along by the winds during the ascent.

Until the advent of radio and radar techniques, meteorographs were attached to such balloons. These instruments automatically recorded the changes in the various meteorological elements as the balloon ascended. The method, however, has one serious disadvantage which makes it impracticable for modern usage: the information is not available until the balloon bursts and the equipment, which descends on a parachute, has been recovered. The delay in obtaining the information is too great to allow it to be of any value for day-to-day forecasting.

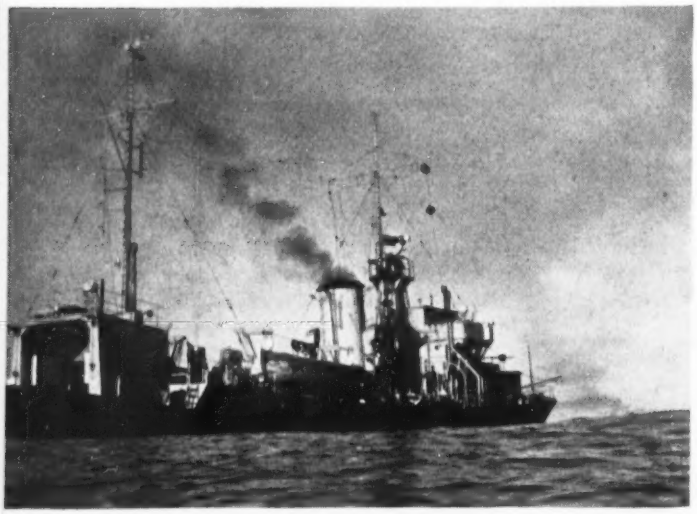
In this method, also, the upper winds were measured by visual theodolite-tracking of the balloons, but the need for clear skies free from cloud was a serious limitation.

The introduction of radio and radar methods as a means of obtaining immediate upper-air information is an important step forward in meteorological instrumentation. To measure the pressure, temperature and humidity at the various heights, a small radio transmitter is now suspended below the sounding balloon. Suitable meteorological elements are incorporated in the transmitter and their readings are immediately transmitted back to the ground station. The information received at the station is therefore available within a matter of minutes of the balloon reaching any particular height, and a complete record showing the variations in the various meteorological factors from ground level to bursting-height is now available less than an hour after the release of the balloon.



For radar wind-finding the radar reflector is suspended below a sounding balloon in conjunction with a parachute. Radiosonde apparatus, seen at the bottom, is also included when data on pressure, temperature and humidity are required. The reflector shown is of the "Umbrawin" type.

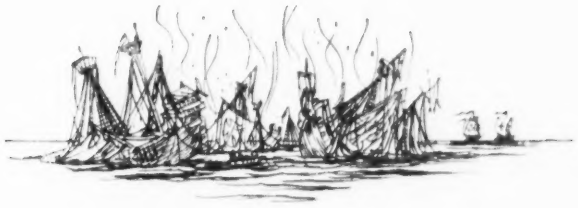
The ocean weather-ship "Weather Explorer." Aft is a balloon-filling hangar. In this picture the hull is partly hidden by a heavy swell.



An extensive network of upper-air sounding stations has been set up under an international agreement covering all the major airlines of the world. It includes the ocean weather-ships maintained by Norway, Holland, Great Britain and the U.S.A. In addition to their meteorological purpose, these vessels also serve a vital secondary need in providing bases from which life-saving facilities are available for any aircraft in distress on the ocean crossing. An intricate network of teleprinter and radio telephone lines from each sounding station to the central forecasting office allows complete upper-air charts over the whole network of stations to be compiled within a very short time of the sounding information being available.

Until the development of radar techniques during the last war, the wind velocity at any particular height was measured by simple radio direction-finding methods, using the signals from the radio-sonde equipment which provided the pressure, temperature and humidity information. While this method was a great advance on the previous visual-tracking method, in that it was independent of local weather conditions such as cloud and fog, the information obtained was subject to serious inaccuracies. These inaccuracies were due chiefly to the use of comparatively low-frequency radio transmission, the normal wavelengths employed being between five and ten metres. At these wavelengths, errors in direction-finding are introduced by changes in the local ground conditions adjacent to the sounding station and, although many improvements were introduced, the final accuracy attainable was still far from that required by the forecasting services in plotting the upper air charts.

Using the simple direction-finding technique, it is also impossible to measure directly the height of the radio transmitter attached to the balloon, though this information can be obtained by calculations based on the pressure-measurement given by the radio-sonde. Although heights calculated from the pressure-



TURNIPP AND THE UNYAN ARMADA

That Don Roderigo de Shallot and the great Unyan armada would sweep the seas was considered inevitable. In Unya the people watched their immense fleet sail away and promptly began to build bonfires for the forthcoming victory celebrations. In Spudland the peasants trembled and made ready to take to the woods.

The King of Spudland called his ministers together. "The enemy," he said, "are at our throats. Their galleons are fortresses, their guns are powerful and their sailors are brave men. What are we to do?"

"It will be some months yet, Your Majesty," said Lord Junction, Keeper of the King's Peace, "before the Unyans are in our waters. We have time to build galleons equal in size and offensive power to those of the enemy."

"How many?" asked the King.

"Enough for our purpose," said Lord Junction.

Then up spake Admiral Turnipp, wise old sea-dog. "Your Majesty," he said, "the ships of the Royal Navy may not be giants, but what we lack in size we can more than make up in numbers, in speed and skill. We have nothing to fear from Don Roderigo de Shallot."

"Brave words, Admiral," said the King. "Are you prepared to stake your neck on them?"

"Indeed I am, Sire. Let the yards build little ships by the hundred and I promise that not one Unyan shall set foot in our beloved land. Meanwhile I propose that we get back to our game of bowls. You will recall, Lord Junction, that I was two up . . ."

A month later the armada arrived in Spudland's waters. A wonderful sight. Hundreds of mighty galleons in line abreast, their sails billowing, their flags flying. By contrast the little ships that went out to do battle with them looked like terriers trying to savage a herd of bulls. But when the engagement began the terriers soon showed their worth.

As the great galleons sailed towards the coast they were each surrounded, disabled, boarded and destroyed. The little ships could fire three shots to the Unyans' one, and were so speedy that they were in under the enemy's nose, and away again, before the galleons could re-load and fire. The battle lasted several days and ended in the complete annihilation of the Unyan fleet. Victory beacons were lighted and the whole of Spudland rejoiced . . .

"So you see," said Admiral Turnipp, "size isn't everything. Would you still advise us to build great galleons, Lord Junction?"

"I would advise you to get on with the game" said Lord Junction irritably. "It so happens that you are four down."

"Maybe," said the Admiral, "but according to my reckoning I'm certainly one up on Don Roderigo de Shallot."

Folland Aircraft Limited, of Hamble, Hampshire, in their programme of research, design and prototype development, take into account national resources, man power, mobility and readiness for defence.

FOLLAND

Which is the Flight Simulator* used by B.O.A.C?

B.O.A.C. photograph

B.O.A.C. photograph

which is the Comet?

In the Redifon Flight Simulator, every necessary detail of the flight deck is reproduced in full scale, so ensuring that the process of familiarisation and the use of flight and power controls are thoroughly appreciated by the trainee crew.

The considerable economies achieved with the Redifon Stratocruiser Flight Simulator, influenced the B.O.A.C. Executive in placing a contract with Redifon for the Comet Series 1 Simulator.

Delivered last year, this new machine is now fully utilised in training B.O.A.C. crews and those of other Comet users.

* *The Redifon Simulator is on the right.*

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RADAR SOUNDING . . .

measurement may be sufficiently accurate at fairly low levels, the accuracy obtainable with existing meteorological elements decreases with diminishing pressure, so that the error in heights derived from the pressure-measurement becomes greater as the balloon ascends.

Today, the development of radar by the armed Services during the last war—and especially the development of centimetric techniques—has opened up a completely new field of wind-finding, and now, by means of "rawin," we are able to obtain wind-velocity measurements to a very much higher degree of accuracy than before. Rawin is a coined word formed from the initials of radar wind-finding and is now internationally accepted. The centimetric radar set emits short, intense pulses of radio energy which are concentrated into a very narrow beam by means of a suitable reflector, much as in the case of a normal car headlamp. If a suitable target is attached to the balloon, a pulse echo is reflected back to the ground transmitter when the target intercepts this beam. When the echo is received back at the radar set it is amplified and presented on indicators, of which there are many types.

The exact nature of each indicator depends on the purpose for which the radar set is designed. For example, for general search work it is preferable to display pictures of the complete areas as the radar aerials are rotated, whereas for gunlaying and radar wind-observations it is preferable to display only the signal reflected from the balloon target, and to adjust the direction of the aerials to track this target. The round-trip travel time of the radio pulse is proportional to the distance (or "slant range") to the target, and by suitable electronic devices this range can be indicated directly at the radar set. Both the angular bearing, or azimuth, and the elevation in which the radar beam is pointed can be measured, so that by this method it is possible to pin-point the position of the balloon in space. A plan chart showing the track of the balloon during its ascent is drawn; and the wind-velocity, at any particular time and height of the balloon's progress, can then be estimated from this chart.

Plotting Up-currents

It is also possible to measure the height of the balloon directly at any time. Whilst this latter information is not of direct use in plotting the upper-air charts—the contour lines being plotted at standard pressure-levels—it does provide a means of detecting variations in the vertical air currents at different levels, since under non-turbulent conditions the rate of ascent of the balloon will be constant over the major part of its ascent and will not show any discontinuities. This is particularly valuable in tropical regions, where violent up-draughts, such as those occurring in heavy cumulo-nimbus clouds, constitute a real menace even to the larger aircraft now employed in commercial aviation.

The maximum rate at which the balloon carrying the radar target rises is limited, both by the economics of the balloon's design, and also by the response-time of the meteorological measuring unit incorporated in the radio-sonde transmitter equipment carried. If the rate of ascent is too high, the finite time required for the meteorological elements to respond to the changes in atmospheric conditions introduces an unreasonable error in measurement. The normal upper limit to the rate of ascent has been found by experience to be between 1,200 and 1,400 ft/min, so that the balloon will take approximately an hour to reach its bursting-height of 60,000 to 100,000ft.

The balloon is carried by the winds throughout the whole of its ascent, so that its range at its maximum height will, obviously, depend on the average winds prevailing during the ascent. With light winds such as those experienced in this country during the summer months, the maximum range may not exceed 10 to 15 miles. At other periods of the year, however, when wind speeds of 50kts and more are quite frequent, the range will often reach 50 to 60 miles before the balloon has risen to 60,000ft. As a result, unless the performance of both the ground radar equipment and the reflector attached to the balloon is capable of ensuring a satisfactory response at these large ranges, the balloon cannot be tracked to its maximum height, and valuable data on the wind-structure at the higher level is lost. This becomes particularly serious as the normal operating heights of aircraft are increased, since forecasts at 40,000 to 50,000ft must be based on data from levels both above and below these heights.

The design of radar reflectors for attachment to meteorological balloons has been the subject of considerable development both in this country and America. Any metallic object will reflect to a certain extent, but the efficiency of a non-directional reflector is comparatively low, due to the fact that the energy reflected from the target is spread out in all directions, whereas the effective part of the radiation is that directed towards the ground equipment. The design of these reflectors has, therefore, been aimed at producing reflectors in which the incident energy is entirely reflected back along its path. The principle adopted is one well known in the field of optics, in which a prism having three mutually perpendicular faces is used to reflect the incident light. This principle can be seen in the design of various reflectors used on the road and on the rear of vehicles. The efficiency of the radar reflector is entirely dependent on the physical size of the three planes, provided they are accurately maintained at right angles to each other. For some time reflectors were constructed from aluminium foil, having a paper backing and mounted on a thin balsa-wood structure, and the various planes were assembled on the station in their correct position. As the size of the reflector is increased, however, the wind-drag on the various solid planes becomes increasingly important, since it impairs the height-performance of the balloon and makes it difficult to release the reflector in high winds. It has been found, however that the efficiency of a plane is only reduced by approximately 5 per cent if the plane has a mesh construction, the hole-spacing being approximately four to the inch for radar wavelengths of the order of 10cm. A special nylon net metallized by the Sucal process to make it conductive has therefore been used in the design of the modern reflectors, and by this means it has been possible to construct "Umbrawin" reflectors having dimensions of approximately 4ft 6in, but still having less aerodynamic drag than the older solid-plane type of approximately similar dimensions. This modern "Umbrawin" reflector (manufactured by the London firm of Chemring, Ltd.) can now be folded in a similar way to an umbrella and erected on the station in one simple movement; and by suitable construction the required degree of accuracy in normality of the planes has been achieved even with the comparatively light framework employed. With these reflectors, and using the standard G.L.3 radar equipment now in use with the Meteorological Office, maximum ranges of up to 100,000 yd are frequently obtained and with this performance wind data up to 60,000ft and more is obtained on the majority of occasions.

Whilst this range-performance meets existing requirements, it must still be improved to meet future demands for information up to 100,000ft, and developments are now proceeding to achieve these results. Although greater ranges can be achieved by increasing the size of the reflector still further with the present form of construction, the weight becomes excessive and the matter of handling the reflector in anything but absolutely calm conditions becomes difficult. An experimental programme is being carried out by Chemring to develop a reflector having no rigid framework and being contained inside a balloon. In this way it is hoped to produce much larger reflectors which will self-erect as the balloon expands, so eliminating any handling difficulties on the ground. The internal reflector is contained in an inner balloon whose diameter does not exceed a size determined by the dimensions of the actual radar reflector. This envelope is then contained in a second balloon which is free to expand in the normal way. A suitable pressure-release valve for maintaining the dimensions of the inner balloon has been evolved and allows the hydrogen to escape into the outer envelope when the diameter of the inner has reached its optimum value. By this design the wind-drag on the balloon and reflector assembly has been reduced to an absolute minimum, since there is no additional apparatus connected to the balloon, which is free to ascend to its bursting limit.

This internal-reflector design has advantages in other fields not necessarily meteorological. In these applications the reflector may be fitted inside a constant-altitude balloon, stabilized so that it may be towed and fly in the same attitude, irrespective of the wind-speed, and this device has many possible applications, such as in radar markers for air/sea rescue work, and also for high-speed towed targets for use in the training of both Naval and Royal Air Force radar operators.

We can, therefore, say that with the successful conclusion to this development many gaps in the field of radar reflectors for specialized applications will have been met. H.J.F.

CONTROL BY JET

THE Office National d'Etudes et de Recherches Aéronautiques (O.N.E.R.A.) have sent us brief details of two British patents which they have held since 1948 and 1949. Both concern methods of control by jet deviation; this subject is one that has resulted in many patents, but O.N.E.R.A. do not state what further progress has been made in putting their ideas to the test.

The first scheme involves profiling the engine tail-pipe and jet nozzle so that the final outlet has the shape of a cross, there being two flat gas streams intersecting at right angles. By deflecting the nozzles in the manner of a rudder and/or elevators stability and control about all three axes would be obtained. The second arrangement consists of the main engine compressor supplying air to two distinct sets of auxiliary combustion chambers, each with its associated nozzle, one nozzle facing forwards and the other to the rear. In normal flight the rear nozzle would be used to supplement thrust; for landing, or other decelerating case, the tapped flow would be passed to the forward-facing chamber and nozzle.

LIBYA POSTSCRIPT

Some On-the-spot Impressions of the Troubles that Dogged Michael Lithgow

THOUGH the Swift F.4's tenure of the world speed record of 737.3 m.p.h was of such short duration (the speed was raised to 753.4 m.p.h. by Lt-Cdr. Verdin, in the Douglas Skyray, only a week later, both records still being subject to ratification at the time of writing), Lt-Cdr. Lithgow's flights in the stifling heat of Libya—a place deliberately selected as an aid to speed—constituted a highly praiseworthy achievement. Some idea of the obstacles that beset the pilot is given in this article, written by one who was present throughout the period.

WHILE the Supermarine expedition to Libya to capture the World's Speed Record may be deemed to have succeeded, there is no doubt that it did so only up to a point; for the speeds achieved by the Swift were well below those expected by Lt-Cdr. Mike Lithgow and the Supermarine team as a whole. In fact, the average of 737.3 m.p.h. submitted to the F.A.I. was originally considered as a try-out only, so confident were Supermarines that something well over 740 m.p.h. was not only possible but probable.

But they did not reckon with the countless setbacks that dogged them from the very start of the attempt to put the record out of American reach. It was, indeed, amazing that Lithgow managed to set up a record at all on his first stab over the measured course in the Azizia wilderness. For on that particular flight everything went against him. In the first place, as *Flight* recorded a fortnight ago, his refrigeration suit failed to cool him sufficiently to make the 180 deg F. cockpit temperatures bearable. The flow through the dry-ice compartment was quite inadequate. In the second place, his fuel gauges would not record and he was forced to cut down the use of his reheat to a minimum, thus achieving maximum speed at the end of the measured course instead of at the outset. He said afterwards that he was accelerating throughout the measured run.

In the third place, Lithgow had difficulty in locating the course after each turnabout, owing to inadequate pyrotechnic marking. Lastly, he was forced to tear away his oxygen mask—the valves of which had stuck—in the middle of one of the high-speed runs, an action which resulted in some rather alarming jinking.

The Swift team worked throughout that Friday night to rectify the faults in the aircraft. New fuel gauges were flown out, and adjustments were made to increase the airflow to the refrigeration suit. The Royal Aero Club too, arranged—successfully, as it turned out—to make the smoke markers more conspicuous for subsequent attempts.

On the Saturday's attempt, Lithgow was under the impression that he had successfully achieved his aim. The Swift was working well, although the cooling suit still failed to function properly. But by this time the electronic timing gear had given up the ghost and was playing tricks which Dr. W. Goldsmith, the Farnborough timing expert, had not succeeded in diagnosing by the end of the expedition. Up to the week-end of October 4th, he was uncertain whether it had been affected by heat or the jolting received during the flight out from Farnborough.

Replacements were flown out from the R.A.E., after which the mechanism is reported to have worked fairly satisfactorily. But it took several days to adjust the clocks. This little lag may have made all the difference, for there was insufficient time left to make a thorough investigation into the reheat troubles that developed after Lithgow had made one of the fastest runs recorded during the expedition. He touched 748 m.p.h., which gave rise to high hopes of establishing at least a temporarily untouchable record.

That there was insufficient time was due mainly to the fact that the Skyray was going for the record at any moment. What had started out as a leisurely visit turned out to be an international race. Both Rolls-Royce and Supermarine technicians worked round the clock. Praising them, Mr. Charles Barter (Supermarine production manager) said he had nothing but good to say for them. They were so keen to get the Swift in trim in time that he had to order them to rest.

Once preliminary adjustments had been made to the Swift's reheat, the local desert wind, which the Arabs call the *ghibli*, sprang up to a sandstorm. It lasted for two days, reducing visibility to such an extent that it was impossible to make even the shortest test flight.

The Swift was hangared behind doors riddled with bullet holes—reminders of the last war. The doors have not been changed, as the holes improve the ventilation. At least, that's what the locals say.

It was interesting to note that, while the Swift was on the ground, the boundary-layer bleeds were sealed with tape against dust and sand. This practice gives rise to some speculation. How are Service pilots going to prevent dirt from entering the bleeds when aircraft so equipped, are called upon to line up for formation scrambles?

Conditions on the Friday improved rapidly after the sandstorm abated. In fact, it was only two and a half hours after the last breath of *ghibli* had died down that the Swift was airborne.

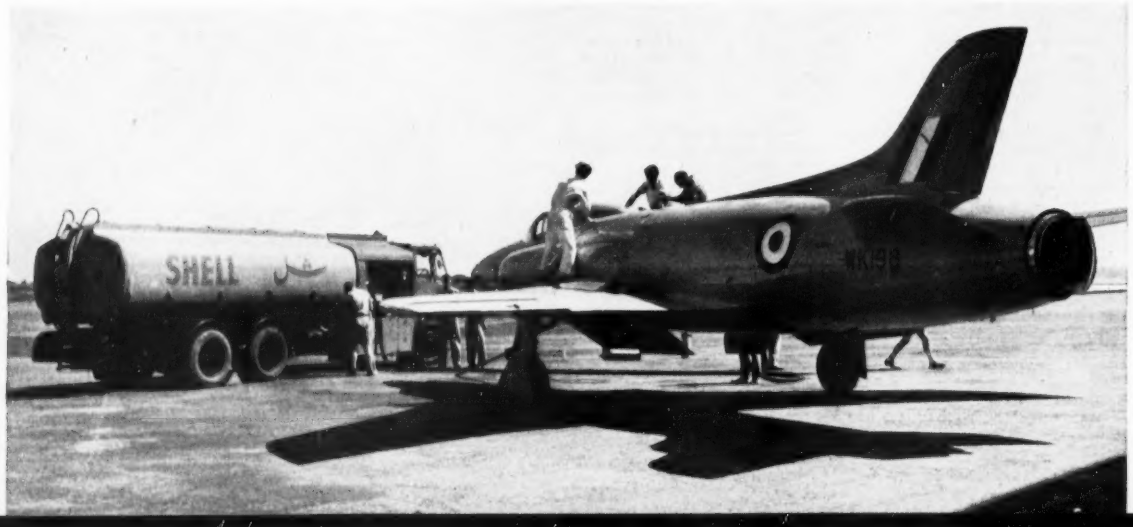
But, once again, the reheat failed to work at full efficiency; and Lithgow returned disappointed. As it was, the r.p.m. permitted were slightly higher than under normal operational conditions. There were doubts as to whether full efficiency had been attained on any of the flights except the one on which the Swift clocked 748 m.p.h.

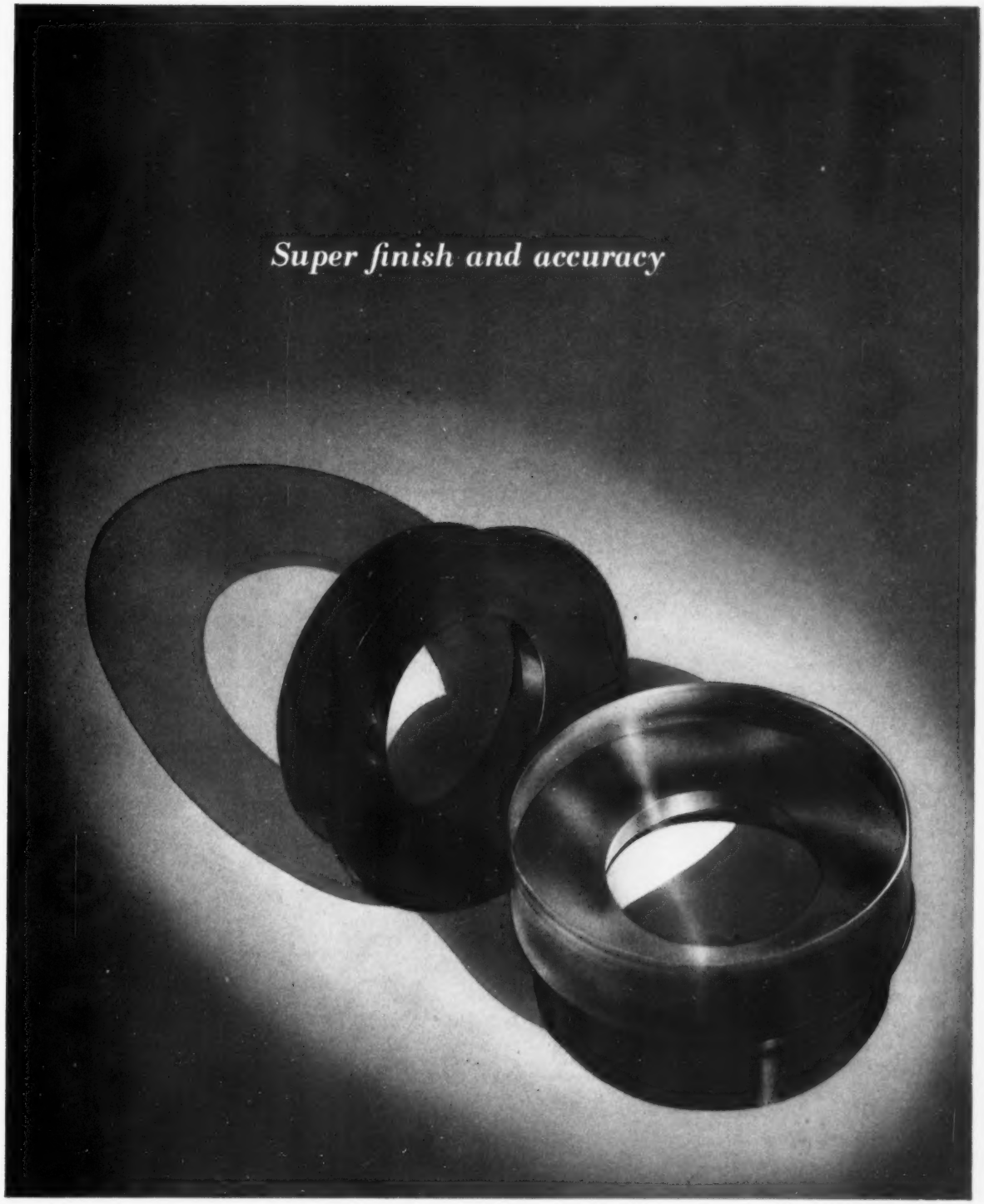
One of the most notable things about the expedition was Mike Lithgow's cheerful demeanour. Despite extremely trying conditions, disappointments and delays, he never once showed signs of temperament. He showed extreme consideration for the ground crews, who he realized were doing all they could to get the aircraft right. Lithgow always had a joke ready, although beneath his good humour he must have felt pretty mad.

A fact that astounded many Idris observers who had previously been at Tangmere was the difference between surface-finish of the Swift and of the Hunter. The Swift was by no means as clean as the Hunter used by Neville Duke in his record attempt. The finish was not as good, and no attempt had been made to fill in the crevices of the mushroom-headed screws that normally hold the boundary-layer fences to the wings (the fences had been removed for the attempt).

In conclusion, perhaps, one should also remember that there are wider aspects—for example, the "tropical trial" nature of the expedition. On this score it was undoubtedly well worth the time and money.

The Swift fills up. Mr. R. G. Woodman, Shell Southern Division aviation supervisor, was at Castel Idris to look after fuelling arrangements.





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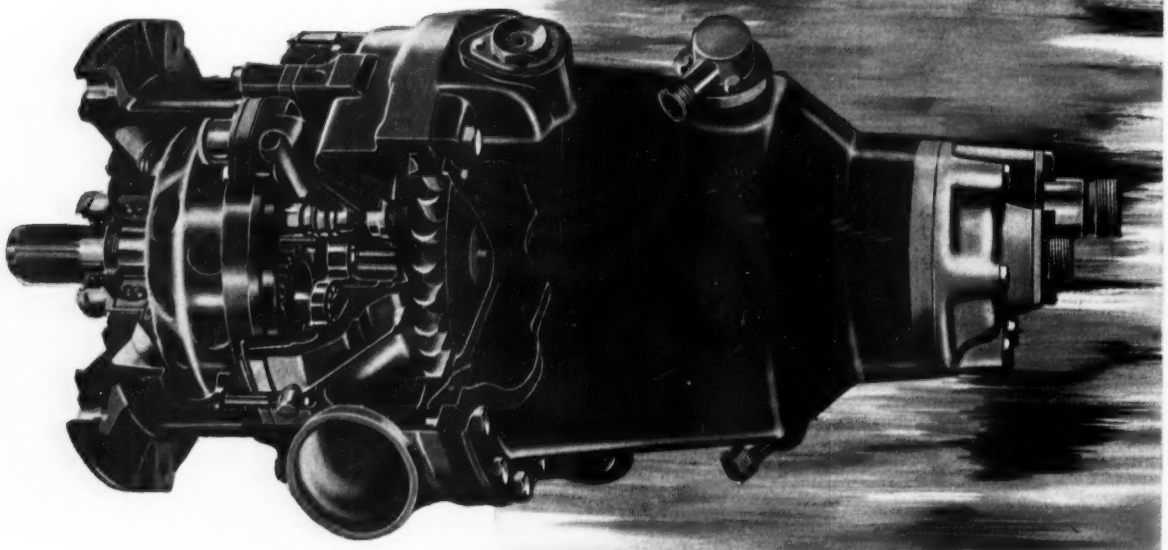

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The Plessey Liquid Fuel Starting System is designed as a lightweight installation operating on an inexpensive, safe fuel which is readily available.

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The system can achieve an engine idling speed within 10 seconds and is controlled from a single push-button.

Consecutive starting of multiple engines can be arranged.

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A35

END OF AN ERA? The Super Constellation is almost certainly one of the last piston-engined airliners built for long-range routes. Longer and heavier than earlier Connies, the L.1049C carries a payload of ub to 22,0C0 lb; the Turbo-Cyclone compound engines give a stage-length of 3,750 miles.

SHOWING-OFF the SUPER CONNIE

K.L.M. Demonstrate the Compound-engined L.1049: New Services Inaugurated

THE recently published annual report of K.L.M. contained a rather disgruntled reference to the delayed delivery of Super Constellations. Several other customers have had similar experiences, presumably a result of the Korean war. At the time of writing the Dutch airline had received six of its 13 Super Constellations, and the new craft were in service on the North Atlantic route. The first revenue flight was on August 15th, when 85 tourist-class passengers flew from Schiphol to North America *via* Prestwick; normal accommodation on the Atlantic route is for 81, but on this occasion there were several babies aboard.

The customary round of demonstration flights marking the introduction of a new type was cut to a minimum in the case of the Super Connie, since K.L.M. were naturally anxious to make up for lost flying time. However, there was a 30-minute trip from London Airport for airline officials, journalists, and travel agents, and the writer welcomed K.L.M.'s invitation to join the party. The aircraft, PH-TFS *Proton*, was substituted for a Convair 240 on a normal afternoon service, and returned to Schiphol immediately after the demonstration, again with fare-paying passengers. Capt. Flemer was in command, and the total crew of nine included two Englishmen: 1st/Off. Matthews and Nav/Off. Sainsbury.

Proton, first of its type to visit London Airport, was quickly spotted on the apron, with its 113.7ft fuselage (over 18ft longer than those of earlier Connies) finished in the latest K.L.M. colour-scheme—white top and trimmings of Oxford and Cambridge blue. The interior *décor*, specially designed for the L.1049C Super Constellation at a cost of $1.5m, is pleasantly luxurious, although less exotic than one might infer from Lockheed's publicity releases. The seats, mounted on concealed rails for quick changes of layout, are upholstered in navy blue with head-rest covers of white nylon; curtains are lemon, and restful pastel shades are used for the carpets. "Tube effect" is completely avoided by skilful use of bulkheads.

On this occasion the aircraft was arranged as a 63-seater. In the extreme tail were two toilets and two wardrobes; next came a cabin with 11 first-class seats; then the vestibule—immediately inside the door—and galley. Turning left on entering the aircraft, one passed through a lounge—complete with "fine-art mural"—accommodating eight more passengers into the main cabin for 40 tourists in five-abreast seats. A curtained passage between two more toilets connected the main cabin with another first-class compartment, this time for 12 people. Looking still farther forward, one noticed the crew's rest compartment, with two large bunks, and the comparatively small flight deck.

Deciding to fly "tourist," I took up a position in the forward part of the main cabin. The seat was comfortable although, for a tall person, the leg-room would probably prove inadequate on a long flight; this, however, is a normal penalty for cheaper travel. Looking out, it was noticeable that the nacelles of the Wright C18DA1 compound engines were already heat-stained.

Despite foam-rubber insulation of the cabin walls and floor, the healthy roar of these 3,250 h.p. units made conversation impossible at take-off. The pilot held the aircraft down after unstick to build up speed for an impressive zoom climb. At about 1,000ft he levelled off and throttled well back. The noise-level dropped appreciably, and although some 50 passengers were now on their feet and exploring the aircraft no change in trim could be detected. The after portion of the fuselage was very quiet and could be compared with the Viscount cabin; but vibration, practically banished by turboprops, was still to be felt here. The stability of the Super Connie, in level flight and steep turns, was reassuring. As it cruised over Berkshire, we noticed that the engines were throttled back to 2,000 r.p.m. (400 r.p.m. below the "max. cruise" setting) and the indicated air-speed was 200 m.p.h.

At a height of 23,000ft, on 1,780 h.p. per engine, the aircraft is stated to cruise at 339 m.p.h. Our impression was that, in practice, it will normally be flown at least 50 m.p.h. slower—perhaps more. Unrealistic cruising speeds are frequently quoted in "selling" new aircraft to the public (though not to the airlines), and the Super Connie has been one of the many offenders in this respect.

After about 20 minutes, as we made a steep descent to London Airport, power was added for a 330 m.p.h. "beat-up" of Runway 28L—not, perhaps, the ideal way to sell air travel, but an unusual and exhilarating experience. I had chosen the noisiest part of the fuselage, and the fact was emphasized at this point. A smooth landing was followed by a surge of sound from the reverse-pitch aircrews, providing smooth and very effective deceleration.

Flexibility of layout is, of course, one of the Super Constellation's selling-points. K.L.M. say they will use several interiors, according to the route and type of service, varying from a luxury layout with 47 seats (including 15 "Sleepairs") to an all-tourist 82-seater. In every case full galley facilities will be retained; the company's aircraft have G.E.C. electric ovens capable of heating 60 meals at once. Incidentally, we believe K.L.M. to be the only airline which includes a chef in the cabin crew on long-range flights.

As mentioned above, Atlantic services with the new aircraft are under way. On October 3rd K.L.M. inaugurated a bi-weekly Super Constellation service from Schiphol to Johannesburg. The Dutch Prime Minister and Minister of Transport were among the passengers. At some sacrifice in payload, and by flying long stages with short transit stops, the service has been made comparable (at least from the elapsed-time viewpoint) with the B.O.A.C. and S.A.A. Comet flights from London to Johannesburg.

Published timetables show that the Super Constellation takes just over a day to cover the 6,000-odd miles between Schiphol and the new Jan Smuts Airport. One flight, leaving each Sunday at 12.30 p.m., arrives at Johannesburg 26 hr 30 min later, having spent a total time on the ground of 4 hr 15 min. There are four intermediate traffic stops—Frankfurt, Rome, Kano and Brazzaville. The other flight, leaving Schiphol each Wednesday, completes the journey in 25 hr 35 min elapsed time; the aircraft does not call at Brazzaville and flies the 2,950-mile leg from Kano to Johannesburg non-stop in 10 hr 55 min. Fastest time on the route is made by the return flight leaving Jan Smuts on Tuesdays, which calls only at Kano and Rome. Except on the shortest sectors, schedules are based on a block speed of around 260 m.p.h.

As employed on the South African route, the Super Constellation is claimed to be unique among airliners in offering three classes of travel. Altogether, 50 passengers are carried—15 tourists forward, 24 surcharged first-class passengers in "Sleep-airs" in the main cabin amidships, and 11 in first-class seats aft. A similar layout will also be introduced on the New York run. Super Constellation services to Tokyo and Djakarta are scheduled to begin early next year and, later in 1954, the type will also fly on the Amsterdam-Curacao route.

Total cost of K.L.M.'s 13 Super Connies, plus spares, is in the region of $30m. Payment has been facilitated by a loan of $7m from the World Bank and by a part-exchange scheme under which seven Constellation L-749s are being returned to the makers for resale. All the new aircraft are being given names connected with nuclear physics; individual designations will be as follows:—

PH-TFP Atom	PH-TFV Meson	PH-TGK Positon
PH-TFR Electron	PH-TFW Deuton	PH-TGL Negaton
PH-TFS Proton	PH-TFX Nucleon	PH-TGM Ion
PH-TFT Neutron	PH-TFY Triton	
PH-TFU Photon	PH-TFZ Isotoop	

This, perhaps, is a sign of the times. But one cannot help visualizing some London Airport visitor commenting on what he will assume to be a missing "i" in "position" or "negation"; and an odd thought is aroused about what happens to an isotope after it has learned to speak Dutch.

R.B.

CIVIL AVIATION

BRANCH-LINE: This study of a Sabena S-55 at Melsbroek symbolizes the rôle of the helicopter as a link between cities and airports. These seven-seat helicopters connect both the city and airport of Brussels with Lille, Antwerp, Rotterdam, Liége, Maastricht, Cologne and Bonn.

RACE REFLECTIONS

FROM the commercial viewpoint, the Viscount's performance in achieving a *block speed* of 304 m.p.h. between London and Christchurch was easily the most impressive feature of the New Zealand Race. This implies no belittling of K.L.M.'s victory. The Dutch airline set out to win and used one of the best available aircraft for the task; the efficiency of K.L.M.'s route organization, the high-performance reliability of the DC-6A and the skill of its crew must not be overlooked. However, the formula applied in the transport section meant that the B.E.A. Viscount would have to fly at 584 m.p.h. to win—clearly an impossible task; indeed, it is an open secret that when the formula was published the airline attempted to withdraw its entry.

Although the Viscount is essentially a medium-stage airliner, giving its best on stage-lengths of around 1,000 miles, it not only completed the 12,365-mile journey in four stages but carried an equivalent payload of over 5,800 lb. Its average flying speed, with comparatively little tail-wind assistance, was 311 m.p.h.—and it is worth stressing that this speed was maintained without "caning" the Rolls-Royce Dart turboprops. We understand that they were run at 13,800 r.p.m., which is only 200 r.p.m. above the normal cruise setting. The ability to extract a high proportion of engine-power for long periods without detrimental effect on reliability or operating economy—one of the most important virtues of the civil turbine—has never been demonstrated to better effect. The airframe, too, responded gallantly to all the demands placed upon it. Take-off weight of *Endeavour* at London Airport, with 2,850 gallons of kerosine aboard, was no less than 62,000 lb—6,000 lb more than the authorized a.u.w. of B.E.A.'s standard Viscount 701s; and the normal gross weight of this machine, the Series 700 prototype, is only 51,000 lb.

Peter Masefield signalled from Bahrein, the first calling-point, that the initial climb to 15,000ft, even in this overloaded state, took only 15 min. A later message from the chief executive—who, incidentally, took two-hour spells of duty at the controls and was in charge of cruise-control—revealed that the ground-speed between Cocos and Melbourne reached 405 m.p.h. The only useful tailwind of the journey was found on this leg—at 32,000ft. Arriving at Christchurch at 9.21 a.m. (G.M.T.) on Saturday, 41 hr 41 min after leaving London, Mr. Masefield reported "Both crew and aircraft in perfect condition and ready to go on around world immediately after standard 15-minute refuelling if required."

TAKEN OVER: Formerly operated by Bharat Airways, this DC-4 called at Cyprus recently in its new Government uniform. The former private routes operated by the Indian Airlines Corporation are known by numbers pending consolidation; thus, the Bharat network is designated Line 2.

On Monday *Endeavour* was due to visit Wellington, returning in mid-week to Christchurch for the prize-giving ceremony. Next week it is to make an Australian tour, visiting several points on the routes of T.A.A., who have Viscounts on order. The itinerary is: Auckland, Melbourne, Tasmania, Adelaide, Canberra, Sydney, Brisbane and Darwin. On October 25th the aircraft will begin the return journey by way of Djakarta, Singapore, Calcutta, Karachi, Bahrein, Nicosia and Rome.

TRANSATLANTIC FREIGHTING

BOUQUETS for Britain and brickbats for PanAm and T.W.A. are evident in the brief published by Seaboard and Western—a big American all-cargo operator—to the C.A.B. It is not the first time Seaboard and Western have applied to the C.A.B. for a certificate to run freight services across the Atlantic to Europe and the Middle East, and they put the potential traffic of these routes at 685,000,000 lb per annum.

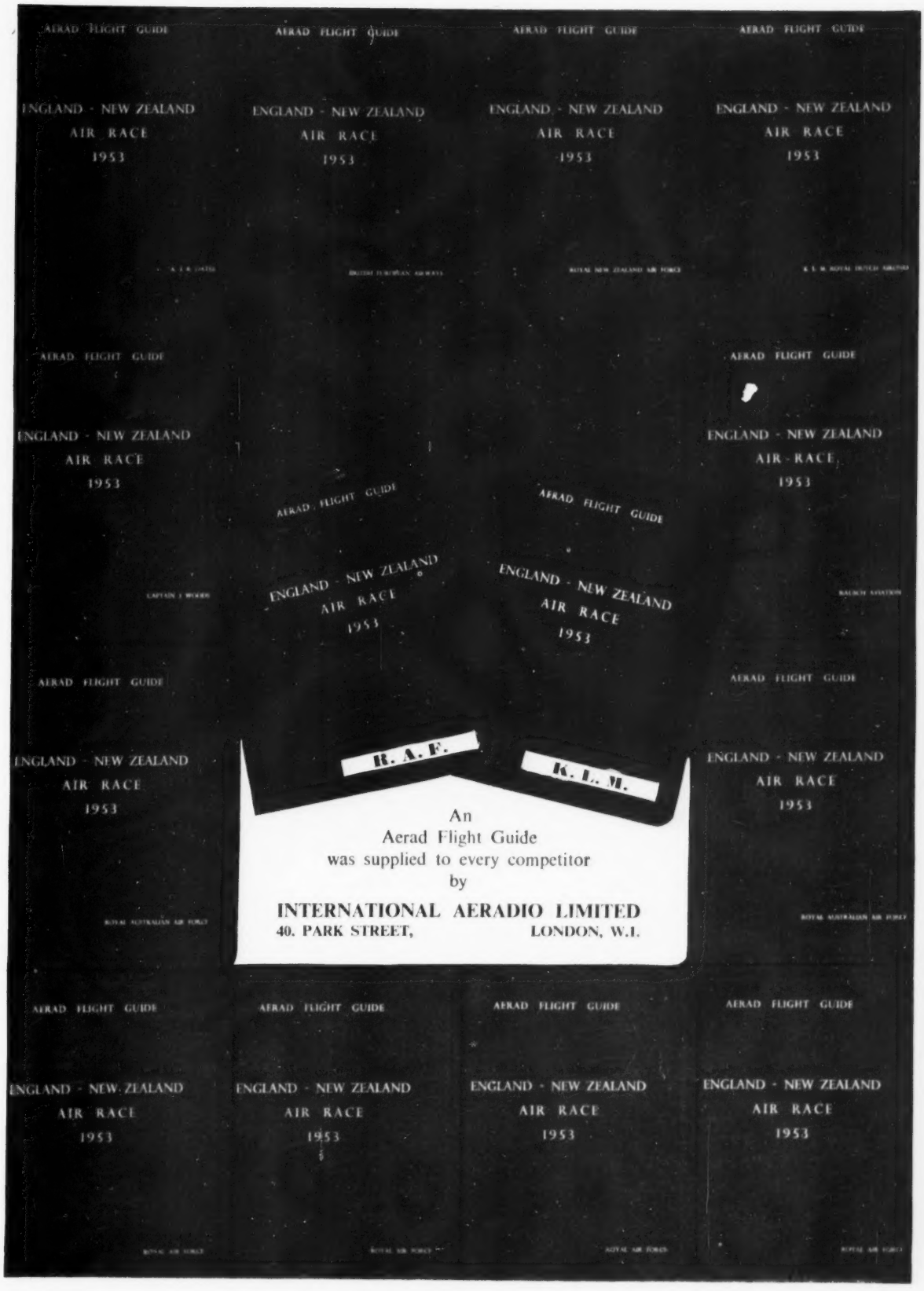
The brief underlines the phenomenal increase in the Transatlantic freighting of such carriers as K.L.M., B.O.A.C. and S.A.S., at the apparent expense of America's certificated flag carriers T.W.A. and PanAm. Seaboard and Western make a strong case for their share of the traffic, using four Super Constellations due for delivery next year. They seem particularly concerned at the recent decision of the M.C.A. to approve Airwork as an all-cargo Transatlantic carrier, and plead that "foreign carriers will secure the lion's share of this developing industry." The brief is a big and informative document and describes clearly the relevant progress made in Transatlantic airfreight since Seaboard made their first application in July 1947.

According to an American report—unconfirmed at the time of going to press—"Bristol temporarily has shelved plans to build a Britannia 200 airfreighter . . . B.O.A.C. reduced its option for these freighters from six to two . . . British independents appear to have a clear shot at this market."

I.A.T.A. HIGHLIGHTS

THE progress made last year by I.A.T.A. was outlined step by step in the reports presented at last week's annual meeting of the Association by the various committees. One aspect of I.A.T.A.'s work is the introduction of standard interline practices and documents which, from the passenger's or shipper's viewpoint, are intended to make "one big airline" out of the 67 member companies. The Traffic Committee reported a considerable increase in the number of carriers becoming parties to interline agreements: 94 are now parties to the traffic agreement, compared with 70 a year ago; 55 have now endorsed the baggage agreement, against 39 last year; and the cargo handling agreement has 33 parties, compared with 17. The committee protested against the adoption, particularly in Europe, of the "c.i.f." method of customs valuation—whereby the cost of transport to the port of destination is taken into account. This normally places a higher valuation on air cargo than on goods sent by sea or rail.

The Technical Committee, reviewing the results of the Helicopter Symposium, affirmed in its report that suitable transport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WELL DONE VISCOUNT

LONDON TO CHRISTCHURCH AIR RACE

Aircraft: **VICKERS VISCOUNT**
entered by British European Airways

Captain:	*W. Baillie*
Co-Pilots:	*A. S. Johnson & S. E. Jones*
Distance flown:	*12,270 Statute miles*
Time Taken:	*40 hours 41 mins*
Average flying speed:	*311 m.p.h.*
Overall speed:	*301 m.p.h.*

(Subject to official confirmation)

The Viscount, first propeller-turbine airliner in the world, is now in service on many routes of British European Airways and Air France, and on order for seven other major airlines. It is designed and built by Vickers-Armstrongs and powered by four Rolls-Royce Dart engines. The fact that this aircraft, developed for medium ranges, was the first transport aircraft to reach Christchurch is striking proof of its versatility.

AT 347 A

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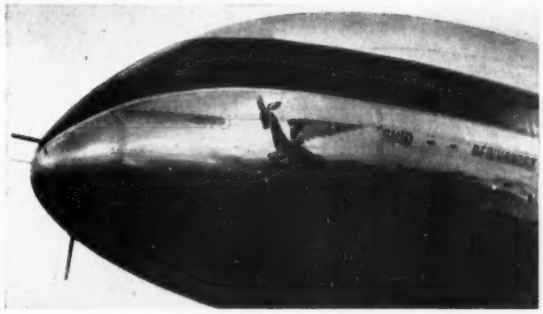

SPRINGBOK COMET: This transfer identifies Comets flown by S.A.A. crews on the London-Johannesburg route (two of the four return flights each week are operated by B.O.A.C. and two by the South African company). The initials B.O.A.C. are retained on the fuselage, and the fin carries both Springbok and Speedbird insignia.

CIVIL AVIATION . . .

helicopters might become available in quantity before adequate facilities, techniques and regulations for their operation had been fully developed, and called for a programme of prototype testing of helicopters under commercial conditions. It was announced that a technical group was at work on specifications for an "ideal fuel" for turbine aircraft; this would be "no less safe than ordinary kerosine; have as high heat content per gallon as practicable; be generally available at the airports of the world, preferably as a presently marketed product; ensure reliable and economic engine operation and no degradation thereof under all airline operating conditions; and have the lowest possible cost consistent with other requirements."

"A grave concern to our entire industry," said the Financial Committee's report, was the alarming growth of revenue accounting costs. It was almost a simple case of "accuracy's costing more than it is worth." An experimental method used in the I.A.T.A. Clearing House of reducing fares to an average rate per km had not proved completely successful, due to the complexity of the intra-European fare structure. Turnover at the Clearing House in 1952 was $218m (28 per cent more than in 1951), of which cash payments totalled only $26m.

AIR-INDIA TO TOKYO

SUPER CONSTELLATIONS will be used by Air-India International, one of India's two recently established state airline corporations, on the proposed new route to Tokyo. The first of the two new Lockheeds ordered by Air-India is due for delivery next April, and the service—from Bombay to Tokyo *via* Calcutta, Bangkok and Hongkong—should begin a few months later. Meanwhile, Mr. S. K. Kooka and Mr. A. C. Gazdar, the airline's traffic manager and operations manager respectively, have been appointed to make a survey of operations and traffic facilities along the route.

TRIALS WITH A BORROWED BREGUET

ACCORDING to Silver City Airways, the most significant result of the recent trials on the Berlin airlift with a Breguet 761 was that the big double-decker's fuel consumption proved to be better than the makers' own claims. The aircraft has now been returned to the Breguet concern while the airline considers the suitability of the type for its cross-channel vehicle ferry services.

During its three months with Silver City, the Breguet was used exclusively to carry very bulky freight between Berlin and Hamburg. Under the command of Capt. C. I. Hopkins, it completed 240 hours' flying and 127 round trips. Towards the end of its spell in Berlin the Breguet was carrying 170,000 lb of freight in six round trips per day. Freight was carried only from Berlin to the port of Hamburg and the aircraft always returned empty.

The total cargo carried amounted to nearly 4,000,000 lb and the average load was 28,250 lb. The Breguet covered the 152-mile stage in 52 minutes against the Bristol Freighter's 63 minutes. It was able to do the work of 3·25 Bristol Freighters and was thus able to release some of these aircraft from Germany at a time when they were most urgently needed for ferry work at Lympne.

SABENA'S MANCHESTER/NEW YORK SERVICE

OCTOBER 28th is given as the inaugural date of Sabena's proposed service from Ringway, Manchester, to New York. Initially, there will be one flight weekly, but the frequency will be increased to two or three flights in each direction by next spring. Operated by DC-6Bs, the service is expected to be the fastest between England and New York. The first aircraft is scheduled to leave Ringway at 10.30 p.m. on October 28th and to arrive at New York at 9 a.m. the following morning. Fares will be £95 7s single and £146 12s return, slightly less than for a journey *via* London.

PROFIT FOR CYPRUS AIRWAYS

CYPRUS AIRWAYS made a profit of £28,048 during 1952, of which £9,250 was paid to shareholders as an 8 per cent dividend. By comparison with the previous year, when the profit was £3,692, revenue increased by 28 per cent, and the number of passengers carried increased—from 21,372 to 26,724—by almost the same proportion. In addition to the operation of services from Cyprus to various points in the Near and Middle East, the company is responsible for the management of the civil section of Nicosia Airport. The annual report notes that during the year under review not a single complaint was received from any of the civil operators who use the airport.

MORE DC-7s ORDERED

FIVE Douglas DC-7s have been ordered by Panagra (Pan American-Grace Airways) for service on the routes between New York and South American cities. The number of DC-7s on order now totals 69; other customers are United Air Lines, National Air Lines and Delta C. & S. National Air Lines, incidentally, last month sold two DC-6s to Australian National Airways at a cost of approximately £1m. The sale was made possible by the impending delivery of DC-7s. It was originally announced (page 482, October 2 issue) that A.N.A. were acquiring four DC-6Bs; in fact, two DC-6s and two DC-6Bs are being bought.

MINISTER UNDER FIRE

THE Minister of Transport and Civil Aviation, Mr. Alan Lennox-Boyd, and Mr. John Profumo, the Parliamentary Secretary for civil aviation, recently received a deputation from residents of Harmondsworth, Cranford and South Harlington who, according to an M.T.C.A. announcement, "gave a full and thorough exposition of their views on the matter of damage to property in the vicinity of London Airport attributed to vibration from aircraft." Mr. Lennox-Boyd promised to visit the areas chiefly concerned and to give further thought to the problem. The Minister will face another group of disgruntled householders on November 5th, when he is due to address a public meeting at Gatwick; the subject on the agenda will be the Government's proposals for developing Gatwick Airport as the main alternative for L.A.P.

Several appointments of private secretaries are announced by the Ministry of Transport and Civil Aviation, which began to operate under its new and rather cumbersome title on October 1st. Mr. S. M. A. Banister and Mr. O. F. Gingell are appointed joint principal private secretaries to Mr. Lennox-Boyd, who has also appointed Mr. J. H. H. Baxter as his assistant private secretary. Private secretaries have also been appointed by Mr. J. Gurney Braithwaite, Joint Parliamentary Secretary (Mr. J. H. Clement); Mr. John Profumo, Joint Parliamentary Secretary (Mr. J. L. Roberts); and Sir Gilmour Jenkins, Permanent Secretary (Miss D. E. Brown).

CANADIAN FREIGHTERS: Elaborate plans have been made by T.C.A. for the introduction, in mid-December, of their new fleet of three Bristol 170 Mk 31s—the first of which is pictured at Filton before its recent delivery flight. Carrying up to six tons of freight, the Bristols will operate scheduled services on the Montreal-Toronto-Lakehead-Winnipeg and Montreal-New York-Toronto routes.

BREVITIES

A RECENT message from Holland said that already 150 people were on the waiting list to fly on Sabena's new helicopter service from Rotterdam to Brussels. Priority was being given to main-line passengers flying by Sabena aircraft from Melsbroek.

* * *

Six of the new Convair 340s ordered by K.L.M. are to be based permanently in the Caribbean and will be named after the six Dutch islands in the West Indies: Aruba, Bonaire, Curacao, St. Eustatius, St. Martin and Saba.

* * *

Field Aircraft Services Africa, Ltd., announce the appointment of Mr. J. F. Fourie as sales director. The Field organization, part of the Hunting group, has companies in the United Kingdom, Africa and Canada.

* * *

Operating a fleet of seven Bell 47Ds on all-mail services, Helicopter Air Service, of Midway Airport, Chicago, have achieved an exceptionally good safety record. Services began on August 20th, 1949, since when the company has flown over 1,325,000 miles and carried 6,000 tons of mail; on September 14th the total of accident-free hours flown by the H.A.S. helicopters surpassed the 25,000 mark.

* * *

The accident investigation and analysis branch of Australia's Department of Civil Aviation recently published the first issue of a new bulletin entitled *Aviation Safety Digest*. Its contents include a summary of incident reports, the value of which is stressed in the introduction, despite the fact that these reports are "viewed with distrust by certain sections of the pilot community."

* * *

The present development of Ypenburg as a fighter and transport base will make it necessary for the two Dutch government flying schools to move from this airfield by 1955; by then it is expected that a new grass aerodrome north of Rotterdam will be ready for use. Advanced civil-pilot training, now carried out at Gilze-Rijen (near Breda), will be transferred to Eelde—a new airport now being built near Groningen which is intended to become the main alternative to Schiphol.

* * *

There is an unusual sound—in these days of widespread opposition to new airport projects—to the report that Lydd, Kent, Town Council have agreed to adhere to their view that they should encourage the proposal (presumably by Silver City Airways) to establish an airfield in their district. At last month's meeting they were told that objections had been received from Maddieson's Holiday Camp, Ltd., and from the Lydd, New Romney and District Ratepayers' Association.

* * *

Under contract to Qantas, B.C.P.A. are operating a scheduled weekly service from Sidney to Tokyo. The flights are being made to take the additional traffic which has built up since the end of fighting in Korea.

* * *

Japan Air Lines have applied to the Civil Aeronautics Board for approval of their proposed services from Tokyo to San Francisco *via* Wake Island and Honolulu and to Naha, capital of Okinawa.

* * *

Swissair have introduced a new daily Convair service linking Zurich with Vienna. It connects with services from London and thus operates in competition with B.E.A.'s regular London-Zurich-Vienna services.

* * *

From November 1st T.C.A. will operate direct flights from Toronto to Prestwick and London; Toronto passengers formerly had to change aircraft at Montreal.

* * *

The discussions which began in London last year on the subject of future arrangements for the existing airline partnerships between the United Kingdom, Australia and New Zealand are being continued in New Zealand this year. In the talks with Australian and New Zealand ministers the M.T.C.A. is represented by Sir Arnold Overton, the retiring Permanent Secretary of the old M.C.A. and Mr. John Profumo, Parliamentary Secretary (who, of course, made the journey to Christchurch as a member of the *Endeavour* crew).

* * *

P.A.W.A. announce that their Stratocruisers and DC-6Bs carried 4,106 passengers across the Atlantic in the seven-day period ended September 5th—an airline record. Carrying 2,280 tourist and 1,552 first-class passengers on the North Atlantic route and 274 first-class passengers on the mid-Atlantic route to Lisbon, PanAm's aircraft, it is claimed, accommodated more people than the *Queen Elizabeth* and the *United States* combined over the same period.

CLUB AND GLIDING NEWS

ELSTREE FLYING CLUB held an informal party on October 3rd at which A.B.A.C. solo and P.P.L. wings were presented to recently qualified members by the chairman. David Ogilvy told us of the apparent lack of pilots (with at least 150 hours' solo) willing to take advantage of the reduced-rate flying of the A.T.C. air experience scheme (the charge to pilots being less than £1 an hour). He also reports the following statistics: August hours, 375, September hours, 300 (all but 50 minutes), and just over 1,000 hours in 95 days.

* * *

SEPTEMBER weather proved unco-operative for the Strathtay Aero Club, whose members logged 99½ hours during the month, compared with 219 hours 20 minutes during August, and 202 hours during September, 1952. A.T.C. scholarship cadets continued to appear regularly in the P.P.L. lists.

* * *

LONDON Gliding Club's programme for the winter season opened with an informal dance at the Dunstable club-house on Saturday last, the date chosen also by the Southdown club for a similar function. Forthcoming events at Dunstable include a film show by Lawrence Wright on October 31st, and a discussion on November 28th by the club's pilots who were successful at this year's Nationals.

* * *

CLUBS in Central and Southern Africa have benefited from the mass sale of fully equipped Chipmunks by the R.A.F. at Bulawayo. The disposal of the machines, which number 57, is part of a clearance sale of surplus R.A.F. equipment due to the forthcoming move of the Service from Southern Rhodesia. Several are reported to have been sold for as little as £500 each, and were considered by the clubs to be excellent bargains, as maintenance work had been meticulously carried out. The 57 have become widely dispersed, and purchasers include the Trans-Nzoie Flying Group of Kenya, the Club de Fort, Madagascar, the Johannesburg Light Plane Club and the Aero Club de Beira.

BARGAIN: Mr. H. M. Murdoch-Eaton taxies his Chipmunk to the runway at Heany R.A.F. Station, Bulawayo, watched by S/L. H. C. McFarlane (right) and F/Sgt. D. Nixon. This was the first Chipmunk to be flown away after the mass disposal mentioned above.

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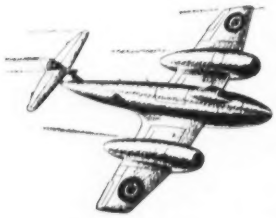

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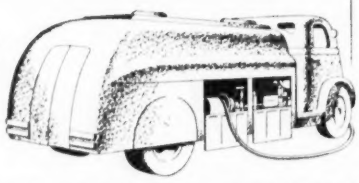

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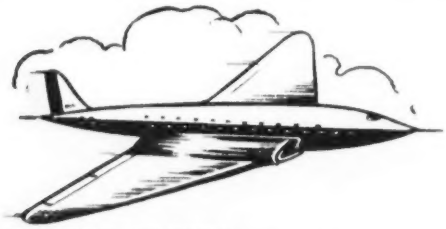

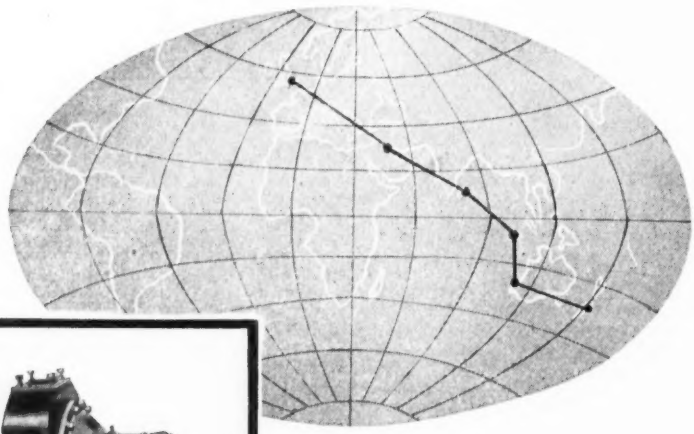

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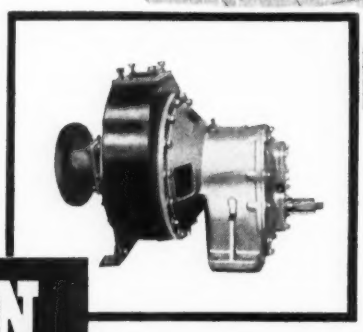

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A Permanent Air Show?

NOW that the S.B.A.C. Show is over, comparisons (however odious) with the French display make two questions inevitable. (1) Should the S.B.A.C. hold the Show at an international airport and construct a permanent building to house the indoor display? (2) Should the display be international?

Farnborough is obviously not ideal, as it is very inaccessible and can only have most makeshift and temporary facilities for a large crowd that comes for only one week out of the 52. But what airport? L.A.P. cannot be spared and Northolt will soon return to the R.A.F., and is too close to L.A.P. anyway. Gatwick offers no immediate solution, but is probably the best long-term bet. has already been left too long unaccomplished—the building of a Gatwick and to hold the Show there every year, this could be borne in mind when laying out the terminal buildings; and so most of the advantages of the ideal, an airport specially built for the Show, could be gained.

The main obstacle, as I see it, is the expense of the exhibition hall if it is only to be used once a year. With both Olympia and Earls Court available in the London area it is doubtful if the hall could be hired out often enough to pay its way.

An alternative is to combine this scheme with another which has already been left too long unaccomplished—the building of a permanent exhibition or museum for historic aircraft. In your issue of September 11th there was a letter on this subject and a few months ago we heard of a private collection coming on the market and likely to go across the Atlantic for want of interest in this country. If such a building could be used for eleven months of the year as a museum both problems might be solved at once. Some 110,000 people visited Northolt last year. Presumably as many will visit Gatwick when it is running, even before one considers those who would visit the museum for its own sake; so if an admission fee has to be charged a good deal of money would be collected. A better method, however, would be for the Science Museum to run it. Only three or four machines can be exhibited at South Kensington, and the first to fly the Atlantic really should not be exhibited in three pieces. Once such a place existed I am sure that aircraft would be loaned or given (or willed) to the Museum from many places.

The second question is, to my way of thinking, simpler. Those who advocate an international show, drawing false comparisons with the Motor Show, should remember that, in the flying display, only one aircraft is demonstrated at a time. If the Show were thrown open to the world, the display would swell to three or four times its present size. As one is presumably allowed the mornings to look at the static display, the complete flying display would take the better part of a week.

Leicester. B. A. MURPHY.

Long-service Wellingtons

WITH reference to the correspondence concerning the date of the Wellingtons' last operation, this was certainly in May 1945.

No. 524 Squadron Coastal Command carried out anti-E-boat patrols off the Dutch coast right up until May 7th—and I believe a sortie took place on V.E. day also, though this might not count as operational.

Chobham, Surrey. P. READINGS.

I WAS very interested in your article on the Wellington ("The Last 'Wimpey'," p. 422, September 18th) but feel I cannot let pass unchallenged the statement that its last operational flight took place in March 1945.

In February 1945 I became squadron engineer officer of No. 38 Squadron, which at this time was operating Mk. XIV Wellingtons from Foggia in Southern Italy as part of the Mediterranean Allied Coastal Air Force. In early April the Squadron moved to Falconara on the Adriatic Coast and continued operating at night on anti-shipping patrols right up to the end of hostilities. I cannot recollect the exact date of the last operational flight but it was certainly during the latter part of April or early May.

No. 38 were one of the six Bomber Command squadrons equipped with Wellingtons at the beginning of the war and must be the only squadron that operated with them throughout—from Ics to XIVs! At the end of the war the unit moved to Malta and continued operating as an A.S.R. squadron with their Wellingtons reinforced by four Warwicks fitted with airborne lifeboats. It was not until I left the squadron in July, 1946, that the first of the Lancaster IIIs came along to replace both the Wellingtons and the Warwicks. As far as I know the squadron are still on Malta, flying their Lancasters on A.S.R. duties.

Now the "Wimpey" has flown for the last time and I suppose that the date of its last operational flight is immaterial, so thank you for your obituary on what must have been one of the outstanding aeroplanes of the war and for which I personally had a great affection.

Solihull, Warwickshire. C. P. ASTBURY.

[The dates given in the article were from official sources, though we have since been informed that they were intended to refer to Wellingtons on bombing duties only.—ED.]

Puffs and Bangs

THE present theory of supersonic bangs which attributes them to the pressure rise across shock-waves does not explain why lesser bangs, or pops, are not produced by aircraft flying at high subsonic speeds. For some time Meteors and similar-type aircraft have flown towards, away from and parallel to the ground with fully developed shock-waves stretched across their wings. Indeed, any aircraft which experiences serious compressibility effects will be found to have a severe shock-wave developed over some part of its structure.

As no instance of a subsonic aircraft producing an aural disturbance has been recorded (and I can hardly imagine that such an occurrence would have gone unnoticed) it is apparent that the bang is caused by an event which occurs *only* when the aircraft exceeds $M = 1.0$. It can be argued that the strength of the shock waves on a subsonic aircraft is weak compared with those on an aircraft in full-blooded supersonic flight, and that it is difficult to imagine a shock detaching itself from a subsonic aircraft. However, it is doubtful whether the difference is so great that an aircraft travelling at $M = 0.85$ should not give some aural disturbance unless, of course, the wave-boom theory is not the complete answer.

A major change at $M = 1.0$ is the fact that the aircraft is travelling as fast as its own sound. Could it not be that the discarded theory of an "accumulated sound" bang is not so wrong after all? Alternatively, can anyone explain the query, advanced by a friend, as to why the simple pressure rise through a shock-wave should cause a bang? A "bang," and likewise the noise of an explosion, is caused by a series of pressure waves in the air following each other in rapid succession. So far no one has shown that the detached shock-waves follow this pattern.

A possible theory might be that the bang is caused by the interaction of the accumulated sound and shock-waves, or that the aural sensation is independent of the detached shock waves.

London, W.14. P. A. HEARNE.

IN BRIEF

For the purposes of an historical survey which he is compiling, Mr. P. M. H. Lewis (39, Fursby Avenue, London, N.3) seeks information—which official sources have been unable to provide—on the aircraft with which the following squadrons were equipped during the periods mentioned: Nos. 112 (1917-1919); 118 (1918-1919); 219 (1918-1920); 231, 234, 235, 237, 238, 241, 242, 243 (1918-1919); 245 (1918); 246, 247, 249, 251 to 260 inclusive, 264, 266, 268 (1918-1919).

FORTHCOMING EVENTS

Oct.	20.	R.Ae.S. Graduates' and Students' Section: "An Introduction to Gas Turbines," by D. H. Mallinson.
Oct.	23.	Aerauto Association: Annual Dinner and Dance, Westminster Arms, Page Street, London, S.W.1.
Oct.	28-30.	Institute of Welding: Annual Dinner and London Autumn Meeting.
Oct.	29.	R.Ae.S. Main Lecture: "A Quantitative Study of Instrument Approach," by J. F. W. Mercer, B.Sc., A.C.G.I.
Oct.	30.	R.Ae.S. Graduates' and Students' Section: Informal Reception and Dance.
Nov.	3.	R.Ae.S. Section Lecture: Development of 4,000 lb Hydraulic Systems," by G. Orloff.
Nov.	5.	R.Ae.S. Graduates' and Students' Section: "Exploration of Space," by Arthur C. Clarke, B.Sc., F.R.A.S.
Nov.	6.	Helicopter Association: Discussion: "The Independent Airline Operator and the Helicopter."
Nov.	6-11.	"Dates" Air Rally, Biskra, Algeria.
Nov.	10.	R.Ae.S. Section Lecture: "Gusts and their Measurement," by J. Taylor, M.A., A.F.R.Ae.S.
Nov.	12.	R.Ae.S. Main Lecture: "Stability and Control in Aircraft Design," by J. C. Wimpenny.
Nov.	19.	R.Ae.S. Section Lecture: "Aircraft Stability and Control," by A. W. Babister, M.A., A.F.R.Ae.S.
Nov.	26.	R.Ae.S. Graduates' and Students' Section: "The Case for the Light Fighter," by P. A. Norman.
Dec.	1.	R.Ae.S. Section Lecture: "Integral Construction," by H. G. Legg.
Dec.	4.	Helicopter Association: "Ground Resonance," by R. Howarth.
Dec.	17.	Anniversary of the Wright Brothers' First Flight.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News

PRINCE OF WALES' FEATHERS: The Fighter Command aerobatic team from Duxford break upwards, outwards and onwards at the end of their display—described on page 532—for the Swedish visitors at Waterbeach last week.

ON PREVENTING WAR: A NOTABLE SPEECH BY LORD TEDDER

BRIEF reference was made in our columns last week to the important Air League luncheon which took place at the Mansion House, London, and at which the Lord Mayor presided. Air Chief Marshal Sir Guy Garrod, chairman of the Council of the Air League of the British Empire, first proposed the toast of "The Lord Mayor and the Corporation of London," and his short but apposite speech, like the reply by the Lord Mayor, was clearly much appreciated by the 180-odd guests present.

The principal speaker was Marshal of the Royal Air Force Lord Tedder, and there can be no doubt that he had given long and serious thought to his address. He began by referring to Cromwell's injunction to put one's trust in God and keep one's powder dry, saying that the advice was good morally, shrewd politically, and sound from a military point of view. Some people would hold that trust alone was all that was needed, but in practice this would mean unsupported trust in individual politicians who happened to be in power in various countries.

Despite all the hopes which buoyed people up during the trials and horrors of the late war, the world had been forced to the bitter conclusion that the law of the jungle still prevailed; that security without strength was a mirage; and that, in fact, weakness invited and indeed provoked aggression.

National strength was not solely a military affair; it was a complex of moral, political, economic and military factors, and weakness in any one might be fatal to the whole. It could not be said too often, or emphasized too strongly, that the military strength which the free world had felt it necessary to build up had one primary objective—to prevent another war. Lord Tedder thought it was questionable whether the two world wars, or indeed the Korean war, would ever have happened had it not been for political and military weakness which misled the aggressor into thinking he could get away with it. Our object was to secure peace not by winning, but by *preventing* another war.

How to organize the collective defence of the free world—to develop and maintain the military strength of a voluntary association of democratic people who by their very nature abhorred war—was no simple problem. What form should the military strength of the free world take? The primary objective was to constitute an effective deterrent but they must also be such as to be able to fight a successful war if the deterrent failed.

The shape of war had been changing drastically during this century and Lord Tedder believed that we would be making a fatal mistake if we were to shape our forces on the basis that a war in the future would be on the same lines as those of the last war—a struggle for lines. The tragic mistake was made before 1940 of preparing for another war of that character. He hoped that the bitter tragedy of the Maginot Line and the lesson it afforded would never be forgotten.

During the last conflict it was the war in the air—unforeseen by many and still not understood by some—which was largely responsible for altering the shape of war. It became one of areas and it might well be that if there were a war in the future it would be one of continents.

Lord Tedder said that so far he had deliberately left the possible aggressor anonymous, but unless and until a new regime in Moscow clearly by word and deed renounced the Stalin aim of world domination the potential aggressor was, in fact, Soviet Russia. This posed specific military problems. All the NATO nations, particularly Britain, depended upon seaborne supplies and were therefore vulnerable to attack at sea. All, and again especially Britain, were open to attack from the air, and all Continental nations were open to attack by land over the relatively short distances from Russian-occupied territory.

Did this mean that in peacetime we had to build up and maintain massive armies with all their supporting air forces on the continent of Europe on the scale which it took four years of the combined efforts of the British and American nations to attain? Did it mean also that we must build up again vast numbers of ships, vessels and specialized aircraft which we had in 1944 to secure our sea communications? And did it mean that every nation must build up the great network of communications, anti-aircraft and fighter defences which proved necessary in the last war? Lord Tedder thought that to attempt to build up military strength on these lines would be not to provide a deterrent but to bankrupt the free world and hand it over to Communism and chaos without a blow.

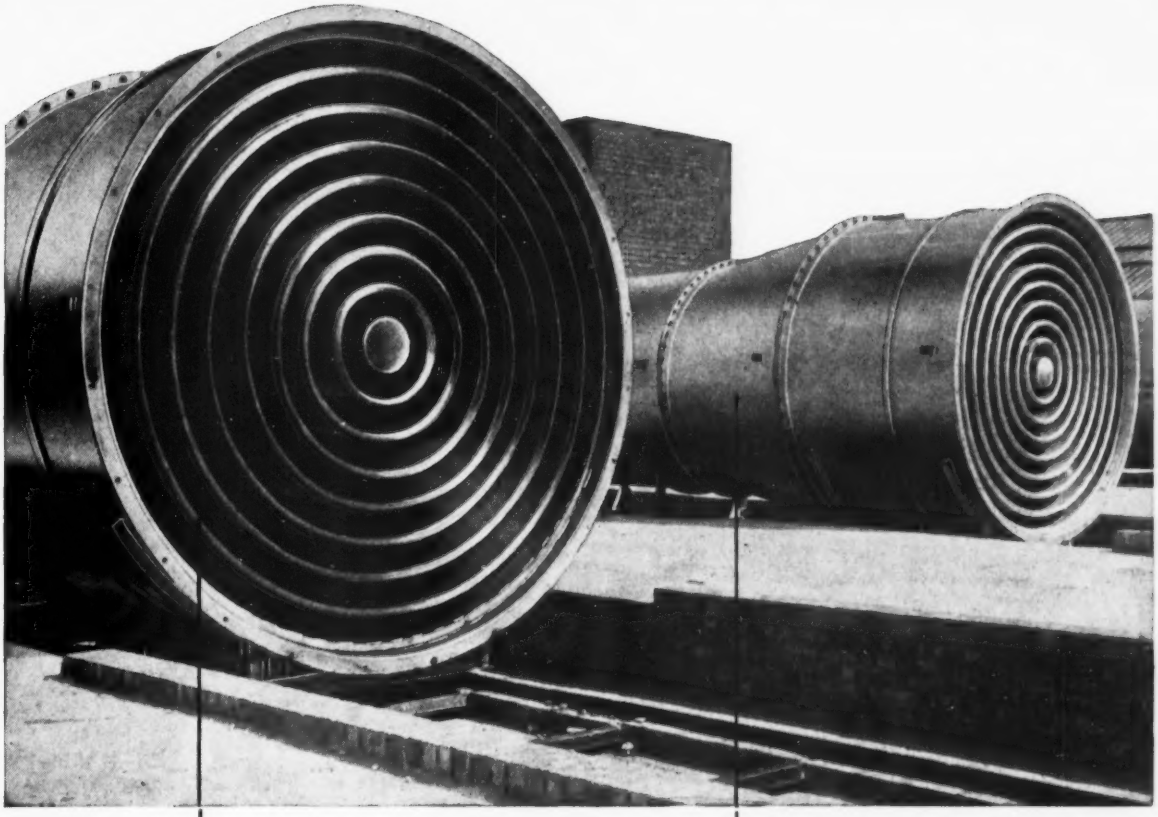
Looking at the other side of the picture, the speaker said that Russia's seaborne

Marshal of the R.A.F. Lord Tedder, G.C.B., D.C.L., LL.D.

supplies were negligible and, against her, our traditional weapon of Naval pressure was virtually innocuous. The history of Napoleon and Hitler should be sufficient proof of the folly of attempting land invasion of those vast areas. Only from the air was Russia open to attack.

Lord Tedder had no simple solution to offer, but he thought that we made the problem unnecessarily difficult by failing to consider it as a unity. There was still a tendency in this country to regard the war at sea, on land and in the air as separate problems. People forgot or ignored the force which in the last war proved to be the one common factor, and did, in fact, unify the operations in the three dimensions—the bomber force.

It was forgotten or not known that the bombers played a vital part in limiting the production of submarines, that the waters around Denmark were littered with German shipping sunk by bombers' mines. The end of the *Tirpitz* was forgotten. It was forgotten that it was the bombers which were mainly responsible for strangling Rommel's supplies; that the bombers knocked the Luftwaffe out of Sicily and made the entry into Southern Europe possible; that the bombers strangled the communications in Northern Europe, hamstrung the German transport and grounded the Luftwaffe for lack of fuel, making Operation Overlord possible. It was forgotten or not realized that, after the first round of the Battle of Britain had been so gallantly fought by day and night fighters, it was the bombers that pushed the air war away from British skies to be



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SERVICE AVIATION . . .

fought out and won over Berlin. It was forgotten that the bombers had delayed the V.1 and V.2 attacks for vital months and reduced them to an unpleasant nuisance. The bombers were the *only* antidote to the V.2. Lord Tedder said that he emphasized all this about the bomber — the offensive component of defence—because he felt it was absolutely essential to remember that purely passive defence with no offensive element was, in fact, no defence at all. In 1944 the Germans were producing more defensive fighters per month than the total British and American production, but they were, in fact, losing the air war and consequently the whole war.

Lord Tedder then spoke of new developments in aircraft and weapons, but concluded that all the indications were that in the immediate future it would be more true than ever that the bomber, and therefore the bomb, would get through. This brought him to the subject of the atomic weapon.

There were very sincere people, he said, who would ban its manufacture or use. He believed the armoured knights of old wanted to ban the use of gunpowder. He could understand the Russians proposing that the atomic weapon should be banned, since it was the *only* effective counter-threat which the Western powers could wield as a deterrent. Lord Tedder believed that there were very few people in this country who had more than the vaguest idea as to the fearful potentialities of the atomic weapons now in sight. He regretted that we in this country were not given more of the facts. If our American friends could face up to them, surely we could, and if we were on an equal footing with them in public awareness of the subject we might be of value to one another in arriving at a balanced judgment as to what action to take.

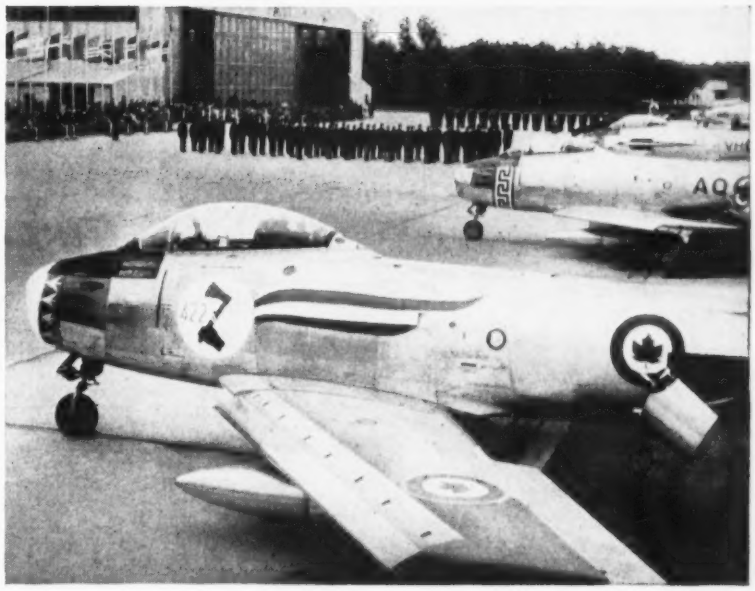
He had seen reports that the American authorities were seriously considering putting the bulk of their defence effort into passive air defence against atomic attack. He himself believed such a policy would be a fatal mistake. He did not think such a defence could be really effective, even at a cost which would (or should) be prohibitive. To adopt such a policy would greatly increase the risk of war, since the deterrent afforded by an atomic bomber force would have been sacrificed. "I am one of those who believe that for some four to five years after the surrender in 1945, aggression was averted by the U.S. atomic bomber force," said Lord Tedder. He continued: "I do not think that the fact that the Russians have now developed their own atomic weapons really lessens that deterrent effect; the fearful counter-threat is still there."

This seemed a gloomy picture, but a contest using the atomic weapon would be no duel but rather mutual suicide, and that was scarcely a prospect to encourage aggression.

The development of the atomic weapon had brought the world face to face at last with the ultimate realities of war. One of the most remarkable developments since the last war had been the growth of a real sense of mutual responsibility among the free nations, and nowhere more remarkable than in the case of the United States, despite their natural absorption in their own problems and their traditional distrust of external commitments.

Lord Tedder concluded by stating his conviction that this country had a vital part to play in the scientific, technical and political field of the atomic world. If we played our part we could show an example of courage and determination, patience and faith, which would help to inspire the free world and give *time* for the fundamental human rights of freedom of speech and thought to spread over the whole world—time for truth to prevail. On this issue Lord Tedder agreed with Cromwell: "Let us trust in God and keep our powder dry."

The speeches were concluded by Lord Balfour of Inchrye who made an appeal on behalf of the Air League of the British Empire.



CANADA'S CONTRIBUTION: The scene at the recently constructed NATO air base at Bad Soellingen, Germany, on September 26th when the station was officially handed over to the Royal Canadian Air Force for No. 4 Fighter Wing. This fourth fighter wing completes Canada's promised —and very generous—air contribution to NATO.

"Weldfast" Concluded

IN the final phase of Exercise "Weldfast," what was believed to be the largest NATO amphibious landing to date was made on the coast of Eastern Macedonia. An "enemy" force, driving down from the north, had pushed Greek defenders southwards and reached the coast at Kavalla. Here an enemy division was concentrated. To support a counter-offensive from the west, the amphibious forces, consisting of Greek raiding forces, U.S. Marines and a Royal Marine Commando, were landed in Eleftherai Bay, 30 miles west of Kavalla, on October 6th. During the landing the use of "special atomic weapons" was simulated.

The assault forces were brought to the beaches by more than 70 ships of the U.S. 6th Fleet, for whom the sea lanes had been kept clear during the preceding phases of the exercise. The convoys were protected by aircraft from H.M.S. *Theseus*, and long-range shore-based aircraft of the U.S. Navy and the R.A.F. kept up constant anti-submarine patrols. Following successful operations on shore, the assault force was re-embarked, and naval forces were withdrawn from the Aegean, bringing the exercise to an end.

ANTI-SUBMARINE PATROLS: Fairey Fireflies being catapulted from the carrier H.M.S. "Theseus" during Exercise Weldfast, recently completed in the Eastern Mediterranean.

SERVICE AVIATION . . .

Laurence Minot Trophy

IT is announced that the 1953 winners of the Laurence Minot Trophy are No. 115 Squadron, commanded by S/L. L. G. Holmes, D.F.C., A.F.C. Second was No. 7 Squadron, the O.C. of which is S/L. D. C. Saunders.

Indomitable to Reserve

IN the charge of four tugs, the carrier H.M.S. *Indomitable* was expected to leave Portsmouth last Monday, to be towed to the Firth of Forth, where she will join the Reserve Fleet. The tow is expected to be completed tomorrow.

R.A.A.F. Squadron Cup

FOR the first time a Citizen Air Force Squadron, No. 3 (City of Brisbane) Squadron, commanded by S/L. A. T. Mather, D.F.C., has won the Duke of Gloucester's Cup for the most efficient squadron in the R.A.A.F.

Major-General Ashmore

WE regret to record the death of Maj-Gen. E. B. Ashmore on October 5th. He was 81 years of age.

During the 1914-18 war he commanded a brigade of the Royal Flying Corps until early in 1917, when he was appointed G.O.C. London Air Defences. From 1924 to 1928 he was G.O.C. Territorial Air Defence Brigade and during the 1939-45 war raised and commanded a battalion of the Home Guard.

Thai Visits R.A.F.

ON Friday, October 2nd, a detachment of the Royal Thai Air Force made the first of a series of training visits to R.A.F. stations and squadrons in Singapore and Malaya. The detachment arrived in a Dakota and six Bearcats commanded by A. Cdre. Prince Rang and his deputy, A. Cdre Chalern Kiert. The party was accompanied by G/C. K. N. Sayers, A.F.C., the British air attaché in Bangkok.

L. G. Groves Memorial Prizes and Award

THE following L. G. Groves Memorial Prizes and award have been won for this year. *Aircraft Safety:* F/L. I. Hutchinson, H.Q., Fighter Command. *Meteorology:* R. F. Jones, M.A., Principal Scientific Officer, Meteorological Research Station, East Hill, Bedfordshire. *Meteorological Air Observer:* F/S. G. N. Franklin, R.A.F. Station Aldergrove, N. Ireland.

F/L. Hutchinson has produced a simple, easily handled computor which provides an air traffic controller with a reliable guide to the capabilities of jet aircraft when in difficulty due to fuel shortage. It shows at a glance the endurance of any jet aircraft for a given fuel supply, and also indicates the distance which can be glided from a given height. The citation states that the computor should prove extremely useful in facilitating the work of an air traffic controller in critical circumstances, and that F/L. Hutchinson has made a valuable contribution to the safety of aircraft and flying personnel.

Mr. Jones has been engaged on research which has direct application to the safety and comfort of high-speed flying. He has made a special study of the employment of radar techniques for examining the internal structure of cumulo-nimbus clouds. Simultaneous measurements of vertical acceleration of aircraft flying through the clouds have also provided a more detailed knowledge of the conditions to be expected by pilots than was previously available. In addition, Mr. Jones has studied the turbulence which occurs at high altitudes in cloudless conditions, encountered by pilots without warning, and has been able to show that some, at least, of the occasons of such turbulence are related to the irregularity of temperature and humidity distributions.

F/S. Franklin receives the award for meritorious work and devotion to duty while serving with No. 202 Squadron. He trained as a meteorological air observer in January, 1951, and since then has flown consistently at Gibraltar and Aldergrove, completing 87 meteorological flights in 1,130 flying hours.

NO BOSUN'S PIPE? The First Lord of the Admiralty, Mr. J. P. L. Thomas, departing by Westland-Sikorsky S-51 from the flight deck of H.M.S. "Theseus" after visiting the carrier during a tour of Royal Navy units in the Mediterranean.

Wyton Award

AT a station parade attended by A.V-M. E. C. Hudleston, A.O.C. No. 3 Group and G/C. L. J. Stickley, Station Commander Wyton, Air Marshal G. H. Mills, A.O.C-in-C. Bomber Command, recently presented the British Empire Medal to Sgt. F. A. Monk for "his untiring work as N.C.O. in charge of ground technical personnel."

Last November and December the Flight carried out intensive flying trials of the latest Avon turbojets installed in a Canberra. The flying programme attained an intensity of 400 hours' flying in 36 flying days. Sgt. Monks was responsible for the servicing of the Canberra. He effected some very rapid rectifications, worked all hours of the day and night and flew at short notice to other airfields to service the aircraft when it was diverted to them. He gained the confidence of the aircrew, and his judgment was respected by all officers flying the Canberra.

R.Aux.A.F. Appointment

THE announcement is made of W/C. G. C. Joyce's appointment to command No. 3507 (County of Somerset) Fighter Control Unit at R.A.F. Rudloe Manor, Hawthorn, Wiltshire.

W.C. Joyce's experience in control work goes back over 11 years and he has been with No. 3507 since March, 1952.

Restoration of St. Clement Danes

ON the recommendation of the Committee appointed by the Air Council to advise on matters connected with the restoration of St. Clement Danes Church for use by members and former members of the Royal Air Force and the forces associated with it, the London diocesan authorities have appointed Mr. W. A. S. Lloyd, M.B.E., F.R.I.B.A., as architect.

It is hoped that the finished building will conform closely to the original Wren design. To this end the Committee are anxious to obtain evidence of the original building in the form of photographs, drawings or fragments, and the Chaplain-in-Chief, Royal Air Force, at 13-17A Cadogan Gardens, S.W.3, would welcome information from members of the public.

The chairman of the Committee, whose appointment was announced on April 16th last, is Marshal of the Royal Air Force Sir John Slessor.

Farms and Gardens

THE unit farms and gardens competition has been won this year by R.A.F. Station Halton with the Joint Services Language Course, Cambridge, second. R.A.F. Station Lindholme was third.

A total of 2,442 acres are under cultivation in the 150 R.A.F. farms and gardens and receipts from the sale of produce last year amounted to £420,706.

Reunions

ROYAL AIR FORCE Wickenby 1942-45, will hold its third reunion in Lincoln on November 21st. Details from W. T. Abbott, College of Aeronautics, Cranfield, Bletchley, Bucks.

The fifth annual dinner of the R.A.F. Reserves Club will be held at the Dorchester Hotel, Park Lane, London, W.1, on November 26th. Tickets, 17s 6d each, may be had from the Club, 14 South Street, Park Lane, London, W.1.

To mark the 40th anniversary of the formation of No. 6 Squadron on January 21st, a dinner will be held at the Belfry Club, West Halkin Street, Belgrave Square, London. Tickets (£1 17s 6d) from S/L. D. J. Fowler, R.A.F. Warton, Lancashire.

Landscapes in Oils. **6.**

Oil on Placid Waters

BY BERNARD HOLLOWOOD

IT is known familiarly and variously as the 'Ship', the 'Cut' and the 'Canal' and Mancunians are justly proud of this famous waterway. The Manchester Ship Canal converts their city into a great seaport, and incidentally allows us to describe the *Esso* establishment at Mode Wheel as an Ocean Terminal.

It was raining hard in an experienced sort of way when we reached Trafford Park and the general outlook was so unsettled, louring and

"... *outlook unsettled* ..."

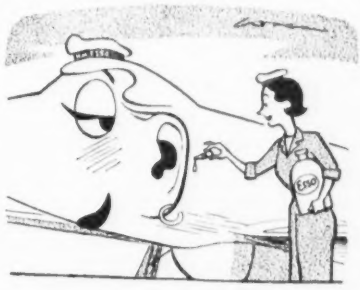
intimidating that we were reminded of the Southerner who ventured an opinion during a 'Roses' match at Old Trafford and was told, very bluntly: "Keep thee clapper shut; 'tis nowt to do wi' thee!"

But our fears were unfounded: we were treated like human beings, all our tom-fool questions were answered, and we were conducted most amiably over the thirty acres of quayside, storage tanks, blending tanks, laboratories, sidings, haulage depots, barrel-painting and -washing sheds and offices of Esso's largest repository of lubricants and heavy fuel oils.

Not so long ago, or so it seems, the lubricants available to transport and industry could be counted on the fingers of one hand; now, they are as numerous and varied as an R.A.F. sergeant-instructor's expletives, and Esso's current list of lubes, classified under aviation, agricultural, automotive, domestic, marine and industrial is as expansive as an encyclopædia.

These products are all conjured from a score or more of basic refined lubricants which are shipped to Mode Wheel from the refinery by ocean tanker. Blends are blended and additives are added.

The blending of lubricants is not unlike the work of the great perfumier. A drop or two of this, a soupçon of that, a hint of this, a dash of that ... and, perhaps, the merest trace of some rare essence,



L'Essence d'Esso.

some *je ne sais quoi*, some additive. The chief differences between the two processes are that one product is tested solely by the nose and the other by the performance of intricate machinery and tools, that perfumes are mixed in small batches and dispensed from miniature bottles while lubricants are blended in bulk (physical agitation by compressed air treatment) and dispensed by the barrel.

There are mountains of barrels at Mode Wheel. The returned empties—many of them—look very sorry for themselves, off colour and out of shape, but a day or so in the beauty parlour and they are as good as new. They are cleaned out by steam, chemical scourers and boiling water: they are dried, tested and hand-painted: and then they are

Wait for it ...

given their dollop of lubricant and a new lease of life.

The total 'throughput' of Mode Wheel is about 200,000 tons of lubricant a year and the bottles, cans and barrels dispatched, if laid end to end, would stretch ever so far ...

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"... *mountains of barrels.*"

"... *made-to-measure* ..."

In aviation circles the products of Mode Wheel are renowned for their reliability and economy in use; but it was impossible on a quick tour to jot down *en passant* more than a few of the labels.

As we left, another tanker was tying-up at the Ocean Terminal, and Mode Wheel was making ready to receive another 10,000 tons of refined basic lubricants. And oddly enough the sky had cleared and the rain was barely noticeable.

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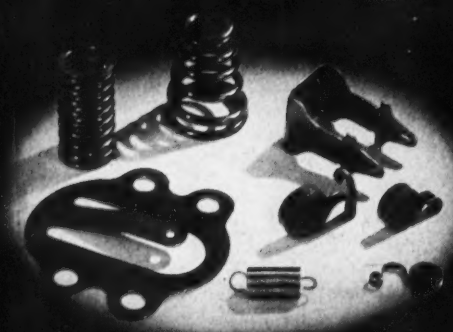

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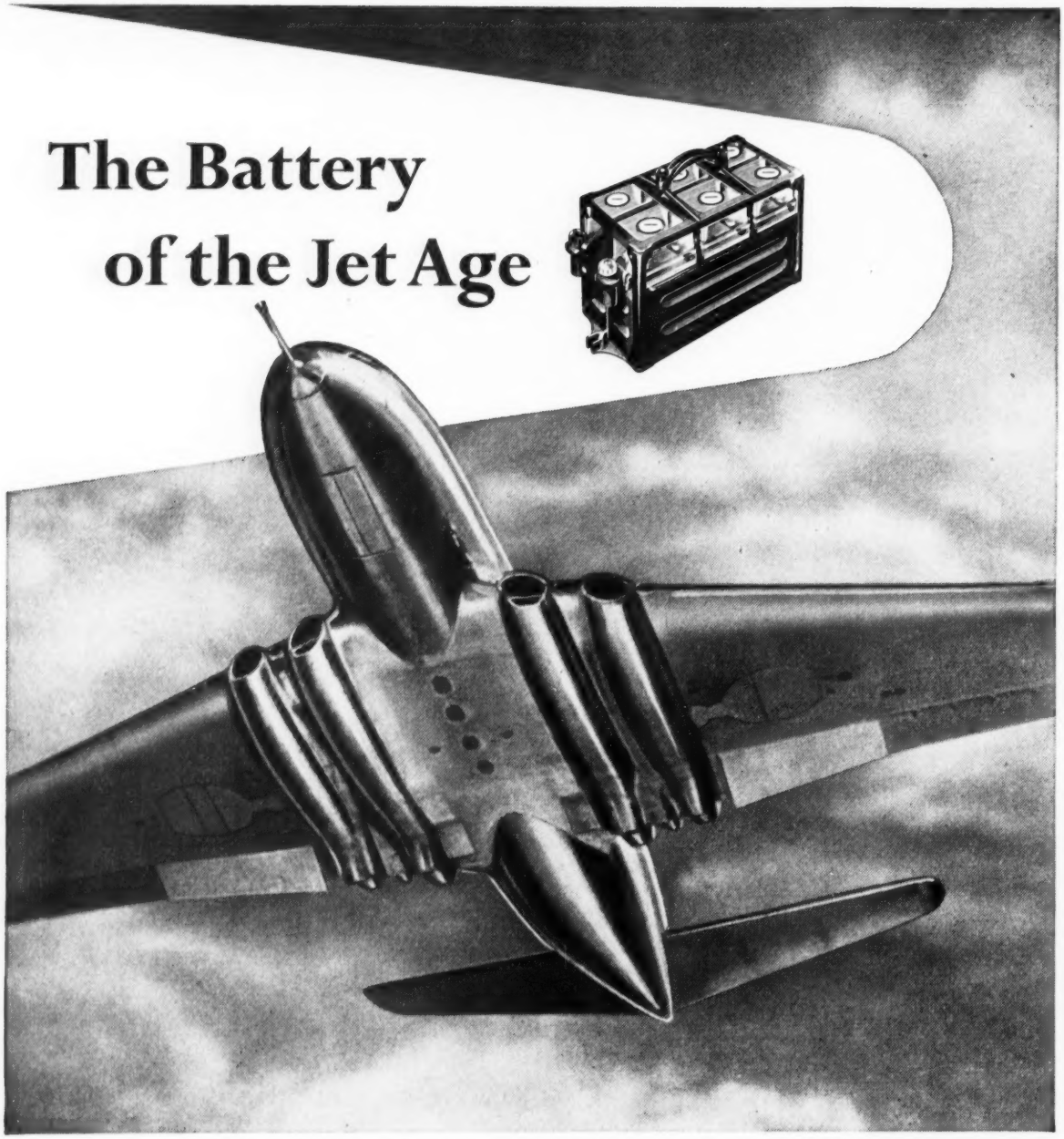

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Oct. 23

A greatly enlarged special issue giving a stand-by-stand report of all the exhibits. Includes a detailed specification of all the cars, and detailed surveys of coachwork, caravans, car radios, tyres, accessories and components. Also includes an analysis of development in engines, transmissions, chassis, bodywork and equipment. Price for this greatly enlarged issue, 2s.

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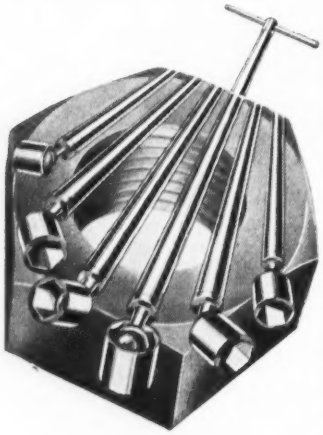

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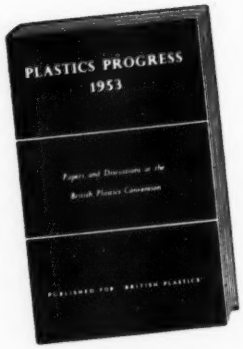

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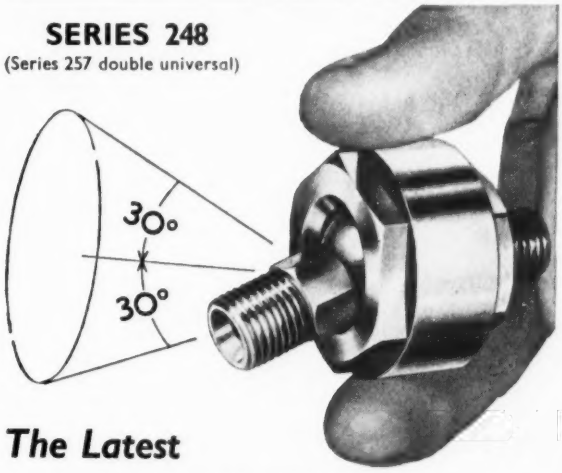

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THIS application will be considered by the Council under the terms of reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to this application must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9 Buckingham Gate, London S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, must reach them within the period allowed for the making of representations or objections. [1165

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INSTRUCTOR required by the Aviation Training unit of Smiths Aircraft Instruments Ltd. Applicants should have a good general knowledge of instruments, auto-pilots and electronic principles and when applying should state age, salary, etc Replies to Personnel Manager, Smiths Aircraft Instruments Ltd., Bishops Cleeve, nr. Cheltenham, Glos., quoting reference SAI/TUI. [1160

HANDLEY PAGE (Reading), Ltd., The Aerodrome, Woodley, Reading, have vacancies in their design offices for a senior electrical draughtsman, senior design draughtsmen, an intermediate jig and tool draughtsman, and for senior, intermediate and junior weightsmen. They are required for work on an interesting new project with good opportunity for advancement in an expanding design office. Please send full particulars of experience, etc., to the Personnel Officer [0235

MINISTRY OF TRANSPORT AND CIVIL AVIATION: air traffic control officers. Applications are invited for at least ten Grade III posts. Age at least 23 and under 35 on October 1st, 1953. Essential qualifications are alertness, good personality, physical fitness, tact and balanced judgment. Candidates must produce evidence of having reached a prescribed standard of educational attainments linked to the pre-1951 School Certificate with matriculation exemption standard. They must have had experience either as (*a*) aircrew in civil air transport, preferably as pilot or navigator, with considerable experience in the United Kingdom, or (*b*) pilot or navigator in the Armed Forces, preferably with considerable experience of air traffic control in the United Kingdom. Exceptionally, candidates without aircrew experience will be considered, provided they meet the educational requirements given above, and have had considerable practical experience either in civil aviation or in the Armed Forces of duties directly concerned with the operation of air traffic control. Additional assets will be a general knowledge of civil aviation legislation and practice, and of radio and radar aids to navigation, and a working knowledge of the French language. Air traffic control officers are required to serve anywhere in the United Kingdom, and are liable to tours of duty overseas. Salary ranges from £495 at age 23 to £760 at 30 or over, on entry, rising by annual increments to £1,006 (subject to deductions from £11 to £42 for posts outside the London area). Posts are unestablished, but have long-term possibilities.—Apply to the Ministry of Transport and Civil Aviation, Room 6024, Berkeley Square House, London, W.1, for application forms and further particulars, quoting reference Staffing B1/ATCO. The latest date for receipt of completed applications is November 6th, 1953. Applications from overseas may be by letter in the first instance, giving date of birth and full details of qualifications and experience. [1166

MECHANICAL draughtsmen. Metropolitan-Vickers Electrical Company have vacancies for men with experience in mechanical equipment, fabricated structures.—Applications, in writing, stating age, experience, salary required, marking envelope "Mechanical Draughtsmen," to Personnel Manager, Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester 17. [0450

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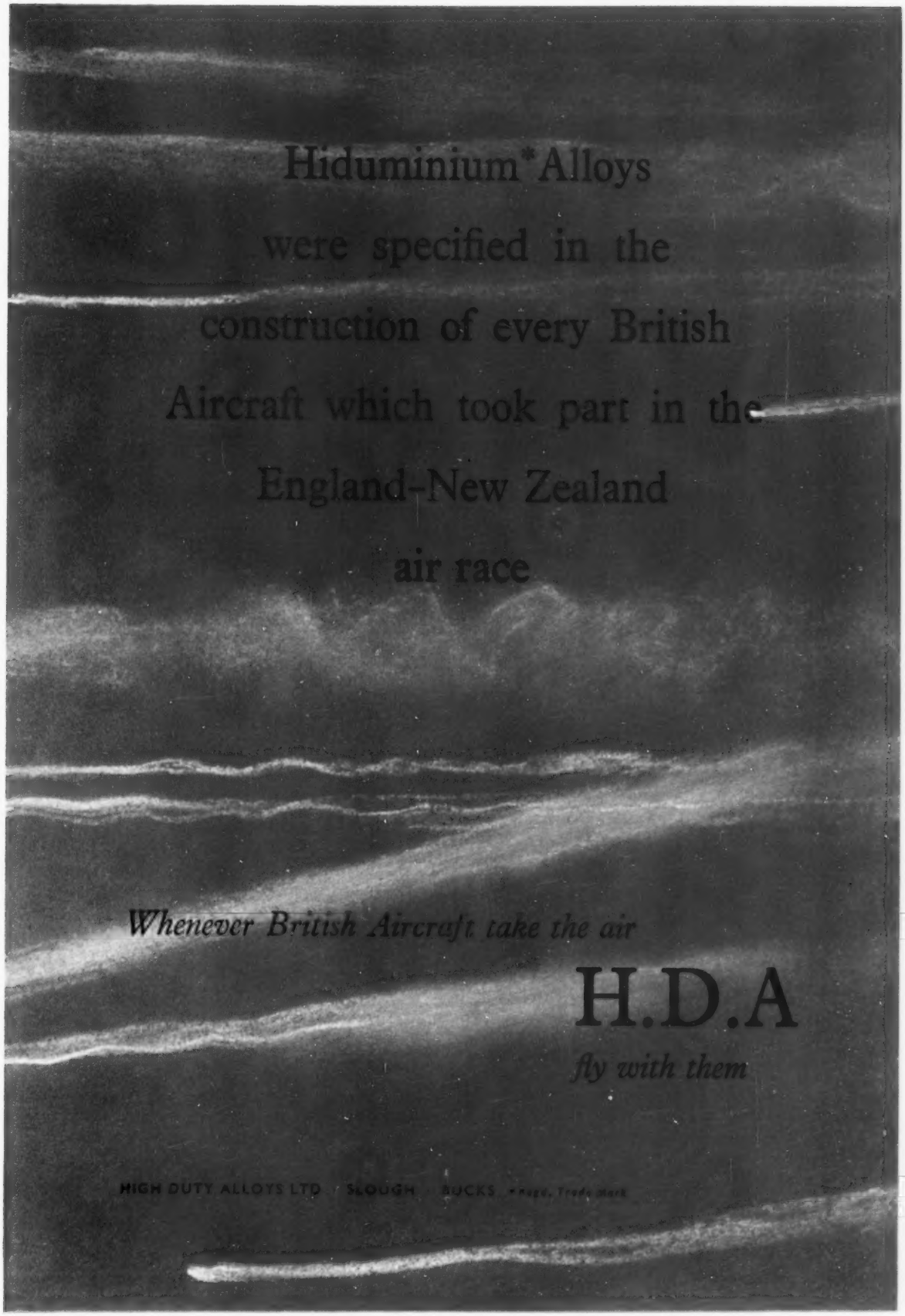
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